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A SUMMARY OF INFORMATION ON THE CONTROL OF LORANTHACEAE IN FORESTRY

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1. INTRODUCTION

The family Loranthaceae, though not very large, is rich in species and well represented throughout the tropical, and to a lesser degree the temperate, parts of the world; in places, some of its members are pests of considerable economic importance for forestry. The genera with which forestry literature has been chiefly concerned are given below, with an indication of their distribution and hosts:

Genus	Approximate distribution	Hosts	Chief mode of dispersal
<i>Arceuthobium</i>	Mediterranean to Himalayas, N. America, West Indies	Conifers	By explosive ejection
<i>Loranthus</i>	Tropical Africa and Asia, Australia, the Pacific	Broadleaved species	By birds
<i>Phoradendron</i>	N. America to Argentina	Conifers and broad-leaved species	By birds
<i>Viscum</i>	Europe (including W. Russia), S. Africa, E. and S. Asia, Australasia	Conifers and broadleaved species	By birds

While few serious attempts at appraising the economic or other damage done by mistletoes are on record, it is considered important enough in, for example, the U.S.A. and Australia, to justify considerable expenditure on both actual control and research. Much, however, has yet to be learned regarding mistletoe distribution, morphology, anatomy, physiology and host relationships. Several studies, chiefly in the U.S.A., are in progress to fill or at least reduce these gaps in our knowledge, and thereby afford a sounder basis for control. A considerable literature on various aspects of control already exists, covering work on many mistletoe species in many lands, and it is with this literature that the present review is concerned. Botanical names are quoted directly from the text of the original papers; it should be remembered, however, that *Loranthus* has been subdivided into many genera (e.g. *Dendrophthoe*, *Amyema*, *Phthirusa*), and that some references to *Loranthus* would now be classified under other generic names.

In theory, mistletoe should be more amenable to control than many fungi, seeing that infections are confined to the aerial parts of the tree, that the seeds cannot be carried far by the wind, and that the

parasite dies along with its host [41]. Control, however, is made difficult by the multiplicity of mistletoe species and hosts, the as yet imperfectly understood host/parasite relationships, and, in many cases, the height above ground at which infection occurs. Measures to combat mistletoe may be conveniently considered under three broad heads—silvicultural, biological, and chemical.

2. SILVICULTURAL CONTROL

Tubeuf in his monograph [58] listed the following general prophylactic measures: maintenance of forest density; surrounding blocks of susceptible species with belts of resistant ones; removal of infected marginal or seed trees; caution in extending the area of susceptible tree species to regions where mistletoe is absent; and control of mistletoe seed-dispersal agents. Kuijt, however, stresses that with dwarf mistletoes (*Arceuthobium* spp.) at least, gaps in our knowledge make any silvicultural control experimental in status [41]. Points of general validity to remember are that: uneven-aged stands are more severely attacked than even-aged ones; the greatest spread of infection is from overstorey trees to understorey trees; good illumination (and warmth) favour the spread of infection; and that removal of the parasite (by logging or pruning) should be done before flowering, or any any rate before fruiting takes place. The main measures are discussed below:

(a) Pruning and removal of infected trees

Both Weeraratna and Kuijt [59, 41] consider that pruning is too costly to be of any real practical value in large-scale forest management, but that it may be economic for orchards, young forest crops, small areas of forest, or individual trees. However, the economics of pruning out mistletoe will vary in each particular case, with the severity of infestation, the value and height of the trees affected, and local labour costs.

De [26] recommends lopping, and Davidson [25] also found that pruning infected branches considerably reduced the scale of infestation in Sal plantations, where the average cost of cutting out the mistletoe was one anna per clump. Again in India, the removal of infected branches (and seriously infested whole trees) is recommended for Teak, and also the maintenance of an isolation belt of forest between plantations and areas where Loranthaceae are rife [40]. In Trinidad similar practices are followed for Teak [6], and pruning to a height of 50 ft. plus removal of all dead or nearly dead trees gave immediate benefits in relieving an attack of birdvine (probably *Phthirusa seitzii*) on *Tabebuia serratifolia* [18].

Arceuthobium spp. are being controlled on 12,000 acres of coniferous forest in New Mexico by cutting out infected merchantable trees and felling or pruning poles and saplings, with follow-up operations planned to take place 6–10 years later. The cost of the initial control averaged \$4.17/acre [37]. Interim recommendations from another trial, in Arizona, are to remove infected trees from even-aged stands at harvesting and to supplement this with one or more sanitation fellings in the residual stand some years later. It is believed that one follow-up operation five years after the original mistletoe removal should effectively reduce damage to a negligible amount for at least 20 years. Pruning is thought to be justified only if done for economic or silvicultural reasons [28, 29]. In Maine, where spraying has proved unsatisfactory, the only effective control measure devised to date is pruning and tree removal [13]. On the other hand, pruning failed to eliminate an infection of *Phthirusa* sp. from a Puerto Rican plantation of *Montezuma speciosissima*, but the unaided vigorous height growth of the trees has practically achieved this by natural suppression [5].

(b) Burning

No trials appear to have been made on the use of fire as a silvicultural tool in mistletoe control. However, a study of dwarf mistletoe incidence in the Pringle Falls Experimental Forest, Oregon, revealed that no mistletoe occurred in an even-aged stand of young Ponderosa Pine established after a fire some 65 years before, except where the pest had spread from infected older trees that had survived the fire. This is held to demonstrate clearly the effect of fire in eliminating mistletoe and making it possible to re-establish a healthy forest [49].

One burning trial of a special nature has been made in S. Australia, where blowlamp-type weed burners (improved versions of flame-throwers) projecting a flame 2 ft. 6 in. long at 2000° F. were used to destroy mistletoe on low timber [1]. The parasite proved highly susceptible to intense heat, and could be destroyed without affecting the trees. Such burners are, however, necessarily of restricted value and could not, for example, deal with mistletoe at the tops of high trees; there is no other record of their use in Australia or elsewhere.

(c) Modification of management systems

This method of control has been advocated for some time against *Viscum album* f. sp. *abietis* on Silver Fir in France [21, 47, 48]. In dense stands the parasite is confined to the tops of the crowns, but any opening due to windthrow, injudicious thinning, etc. gives it an opportunity to spread down the stem. It particularly attacks old trees, and trees grown at altitudes below their normal range. When the mistletoe is well established, the best methods of control are either the removal of heavily infested trees, or shortening the felling cycle. Preventive measures include felling at a mean d.b.h. of 45 cm. rather than 60 cm., shorter felling cycles, and an increased use of mixtures. It is held that the parasite would be of only secondary importance if felling cycles were adapted to the climate, and the mean stand age reduced.

Logging practice in infected adult stands significantly affected the incidence of *Arceuthobium* on Western Hemlock reproduction in British Columbia [23]. Clear felling resulted in only slight, scattered infection of the young growth; even where occasional trees or scattered blocks were left, the mistletoe had rarely spread far into the reproduction; but with selective felling, mistletoe was present throughout the new stand. For infected mature and overmature stands it is recommended that: in clear felling, all residual trees and advance growth should be destroyed, the areas clear felled to be as large as is silviculturally tolerable; in block felling (leaving small blocks of timber or widely scattered trees), blocks infected with mistletoe should be removed first, and seed-trees should be selected for their good form and apparent freedom from mistletoe. For infected immature stands it is recommended that: in any form of partial or selective felling, all trees with mistletoe should be removed in the first felling, even to the extent of reducing this felling to a non-profit operation; in thinning, infected trees should be removed first, and an inspection made about five years afterwards to remove any remaining or freshly infected trees.

Clear felling is also recommended to check infection by *Arceuthobium pusillum* in even-aged Black Spruce [17], the extent to which clear felling is necessary being determined by the stage of development of the infection. Nordin [45] considers that clear felling the entire stand or whole infected patches in a stand is the most effective way of eradicating dwarf mistletoe in Lodgepole Pine in Alberta, taking into account the present lack of knowledge regarding the biology of *Arceuthobium*. More study is necessary to evolve the best possible management system for infected Pine stands, and to develop cheap, easily applied selective herbicides.

(d) Isolation strips

These may be made and maintained either by removing all potential host species from the strip, or by regular inspection and removal of any mistletoe invading trees in the strip. The width of the sanitary zone necessary to prevent mistletoe spreading into an area depends largely on the mode of seed dispersal of the mistletoe concerned. In Trinidad, a $\frac{1}{4}$ -mile strip is considered necessary to isolate Teak from sources of infection by Loranthaceae [6]. On the other hand, *Arceuthobium*, the fruits of which eject the seed explosively, can be controlled by strips only 60 ft. wide [2]. Koppikar mentions the value of isolation strips of forest to protect Teak and Casuarina plantations in India, but makes no firm recommendations on strip width [40].

(e) Resistant species and individuals

Control is also possible by using mixtures of resistant and susceptible species, or by conversion from susceptible to resistant species. In the Silver Fir forests of France, species recommended for admixture are Spruce, Larch, Scots Pine, Beech, Maple, Lime and Chestnut. At altitudes up to 800 m., the proportions recommended are 30% Fir, 30% other conifers, and 40% broadleaved species. From 800 m. to the upper altitudinal limit for mistletoe, the mixture advised is 45% Spruce, 25% Fir and other conifers, and 30% broadleaved species [48]. Clear proposals of this sort do not appear to have been made elsewhere. However, host/parasite lists have been drawn up for many tree and mistletoe species in several countries [19, 26, 38, 41, 42, 52, 53, 55-60], which may reveal suitable resistant tree species for given conditions and locations. The use of mistletoe-resistant species may be a very promising method of preventive control, especially in countries, such as China, having a relatively small area of existing forest but extensive afforestation programmes [57]. It is unlikely to be of much value in the vast areas of existing coniferous forest in North America or the U.S.S.R., for example.

The possibilities of breeding and selection for mistletoe resistance have gained some recognition, at least in the U.S.A. In experimental studies on host resistance in Ponderosa Pine in the Rocky Mountains [14], systematic searches have so far discovered ten individual trees exhibiting phenotypical resistance. Roth, too, mentions the high resistance to infection shown by some young Ponderosa Pines [49].

3. BIOLOGICAL CONTROL

(a) *Hyperparasitic plants*

Five species of fungi have hitherto been found parasitic on various species of *Arceuthobium* in North America, but studies of their possible use in biological control are still at a very early stage. Some successful inoculations have been made with *Septogloeum gillii*, but the failure of the fungus to establish itself after inoculation in N. Utah and E. Idaho suggests that it would be a doubtful aid in biological control in this area, possibly owing to the dry climate [27, 43]. *Wallrothiella arceuthobii* occurs only on female mistletoes, attacking the seed-bearing parts. In Saskatchewan it has been found on 78% of trees bearing female mistletoe plants [7]. A third fungus, *Metasphaeria wheeleri*, found in a single Californian locality on *Arceuthobium campylopodum*, is thought by Kuijt [41] to have probably little value as a potential biological control. Another fungus, *Colletotrichum gloeosporioides*, has been found in California killing dwarf mistletoe shoots in all stages of development, and also invading the endophytic system [46]. The spores germinated over a wide temperature range and inoculations have proved successful, so this species is considered of promise in biological control. An unidentified fungus that can affect dwarf mistletoe seriously, though only in certain areas, is now being studied in Colorado [14].

Less attention has been paid to parasites of the American *Phoradendron* spp., which are less important for forestry. However, *Protocoronospora phoradendri* is known to attack the leaves and stems of *Phoradendron flavescens* var. *macrophyllum* (which infests Willows and Poplars in parts of California), usually causing death of the mistletoe [24]. Hartigan considers that there is little promise of biological control by fungi in Australia [36]. Several fungi and epiphytes have been recorded on *Viscum* [58], but their effect is unknown.

A hyperparasitic mistletoe in Ceylon, *Viscum capitellatum*, has been shown to infect *Dendrophthoe falcata* and to be capable of controlling the latter effectively in places [59]. Attempts to germinate its seed on *D. falcata* have succeeded and it has also been observed as a hyperparasite of other mistletoes. The Australian species, *Nothothixis* [*Nothothixos*] *subaureus*, is also usually parasitic on other mistletoes [60].

(b) *Insects*

Many insects are known to feed on mistletoes. As early as 1918, 21 species were recorded on European mistletoes and 57 species on Loranthaceae outside Europe [50]. In America, few insects are considered to be of value in dwarf-mistletoe control; spittle-bugs (Cercopidae) are probably the most destructive, mining in the stems and killing entire shoots [41]. Weeraratna found that the larvae of a pierid, *Delias eucharis*, fed voraciously on leaves and even tender branches of *Dendrophthoe falcata* [59]. In trials with this insect, complete defoliation killed *D. falcata* tufts 6 months old; slightly older tufts re-flushed, but an immediate second defoliation proved fatal. There is no known insect that gives any promise of biological control in Australia [36].

(c) *Birds and mammals*

It has long been observed in Germany [58] that tits eat, not the sticky pulp of mistletoe fruits, but the seeds themselves, and tree-creepers too are alleged to do this. On the other hand, destruction of mistle-thrushes, which void the seed, has been mentioned as a possible method of controlling seed dispersal [58].

Mistletoe foliage is eaten by several kinds of deer, hares, rabbits, and chamois in Europe, especially in winter [58], and by opossums in Australia [16], but using mammals for the biological control of mistletoe is generally regarded as impracticable.

4. CHEMICAL CONTROL

Two main methods of chemical control have been adopted, viz. spraying, and host injection (including application by frill girdling). Dusting has not received any attention as yet.

(a) *Spraying*

Early work by the Division of Plant Industry, C.S.I.R.O., in Australia [30] with sprays of CuSO_4 (16%), Dinoc (1.2%) and methoxone (0.8%) applied separately to the foliage of the mistletoes and Eucalypt hosts gave little promise of success and no evidence of translocation from the leaves of the host to the parasite. Their later work has been concentrated mainly on the stem-injection technique. However, the Division of Wood Technology of the New South Wales Forestry Commission, in trials started in 1948, reported successful control of Loranthaceae with sprays consisting of 0.5% aqueous

solutions of the Na and the amine salt of 2,4-D [33]. Stickers (e.g. casein) and hygroscopic adjuvants (e.g. glycerine pitch) were found to be advantageous with the Na salt, but did not reinforce the effect of the formulated amine salts. Over-all spraying of both host and mistletoe is possible, but it is more economical to spray the individual mistletoe plants alone. Short bursts of spray at the heart of the mistletoes are best, and ten gallons of spray should be sufficient for about 200 mistletoes. The best time of application is after the first spring flush of host and mistletoe, and after a shower of rain. Neither the esters of 2,4-D nor 2,4,5-T compounds proved as effective as the Na and amine salts of 2,4-D. A kill in the region of 90% can be expected from a single spray treatment, the mistletoes becoming brown and withering within three weeks, but a follow-up spray late in the season is advocated. Members of the Myrtaceae (especially *Eucalyptus* spp.) are not adversely affected by 0.5% sprays, apart from some slight reaction of the shoots, but trees such as Acacias, Kurrajongs (Sterculiaceae) and Casuarinas are severely defoliated. Control by spraying is favoured by the fact that the mistletoe is usually attached to the lowest third of the crown and mostly attacks isolated or open-grown trees which are more or less accessible for spraying [33, 34, 36].

Sprays have not proved so promising against *Arceuthobium* spp. on various coniferous species in North America. Aqueous solutions of five herbicides at concentrations of 1/1, 1/5, and 1/10 were sprayed on dwarf mistletoes parasitizing Lodgepole Pine in Alberta. MCP-5, 2,4-D ester, and 2,4-D amine caused the mistletoes to wither, but seriously affected the host; Chlorax *per contra* caused no apparent damage to the mistletoe, but did severely brown the Pine foliage; only the two weaker MCP-3 sprays caused the mistletoe to wither quickly, without any apparent injury to the host [20]. In Maine, maleic hydrazide 40 at concentrations of 0.25 and 0.5%, and MCPA at 0.3%, proved unsatisfactory against dwarf mistletoe on Spruces. At best, only the aerial parts of the parasite were killed, while MCPA caused excessive burning of the Spruce foliage [13]. Maleic hydrazide was also ineffective against dwarf mistletoe on Lodgepole Pine in the Rocky Mountains, as were Acti-dione and its derivatives. Solan, Karsil, Dacryl, No. 5996, and Tinsan sprays showed no effect on either host or parasite after three months [14]. Esters of 2,4-D and 2,4,5-T used as aqueous sprays at 0.1 and 1% concentrations have been applied directly to dwarf mistletoes on Ponderosa Pine saplings, and to the bases of the cut shoots. In most cases the mistletoe shoots were destroyed, but new shoots invariably appeared in the next season, and there was also some damage to the hosts. Research is needed to get dilute herbicidal solutions into the sapstream and so increase the likelihood of destroying the haustoria [10].

In India, several chemical and 'hormone' sprays have been employed against *Dendrophthoe falcata* parasitizing *Anogeissus pendula*, *Achras sapota*, *Chrysophyllum oliviforme*, *Callistemon lanceolatum*, *Mangifera indica* and *Psidium guajava* [51]. CuSO_4 , even at 4% concentration, had only a 'mild' effect; $\text{K}_2\text{Cr}_2\text{O}_7$ at 4% killed only parts of the mistletoes, while injuring the hosts; NH_4 sulphamate at 4% killed a few of the mistletoes, but also injured the hosts. The effect on both parasite and host of 2 and 3% concentrations of all these sprays was correspondingly less. Host reaction to 2,4-D, its Na salt, and the K salt of 2,4,5-T (all at concentrations of 0.5, 0.7, and 1%) varied considerably. *M. indica* and *P. guajava* were seriously injured, while *A. pendula* and *A. sapota* were virtually unaffected. With 2,4-D at 0.5%, the effect on the parasite was slight, and two sprays at about a month's interval were necessary to kill it. Single applications of the stronger concentrations killed the parasite in 4 to 5 months. The effects of the Na salt of 2,4-D and of the K salt of 2,4,5-T were almost the same as those of 2,4-D. On the basis of these findings, none of the 'hormone' sprays can be recommended for general use.

It is difficult to make useful comparisons of the findings of spray trials in Australia and India (*Loranthus* spp. on hardwoods) and North America (*Arceuthobium* spp. on conifers). Herbicides and dosages toxic to the parasite in question but harmless to its host must be worked out by trial and error for each parasite/host combination. The exotic coniferous forests of Australia are not yet infected by any mistletoe, and in America no work has been done on the control of mistletoe on broadleaved species. In general, findings seem to indicate that the 'hormone' sprays are the most promising.

(b) Host injection

The first trials specifically designed to control mistletoes by means of host injection were started in Australia [30], and have been in progress since about 1946. However, the effect on *Loranthus* of host injections of phytotoxic chemicals was noted as early as 1937 in India [39], during the course of experiments on the control of spike disease of Sandal (*Santalum album*) trees with salts of Hg and Cu. Injections of CuSO_4 had no effect on the virus disease, but large *Loranthus* bushes on the Sandal trees under observation dried up and failed to re-sprout.

In order to test this suspected effect properly, Kadambi later injected CuSO_4 into several *Dalbergia*

sissoo trees via small holes bored round the stem at ca. 6-in. intervals [39]. A few months later the leaves of the *Loranthus pulverulentus* parasitic on the trees began to wilt, shrivel up, and die; observation up to 1952 showed that the dead *Loranthus* did not re-sprout. However, the action of the CuSO_4 was relatively slow. In further trials, Fernoxone (a 2,4-D preparation), and CuSO_4 followed by Fernoxone, were used at rates of $\frac{1}{4}$ oz. CuSO_4 and $\frac{1}{32}$ oz. Fernoxone, per hole. Both treatments caused the *Loranthus* leaves to start shrivelling after about a week, and in a few months 23 out of the 28 clumps (on 8 trees) were dead. The best season for treatment was March-April. It is thought that doses double those actually used might be fatal to the hosts. One worker can treat 20-30 medium-sized infected trees in a morning, and the parasite, once killed, does not reappear for at least four years. Singh [54], however, sounds a note of caution on the use of CuSO_4 and Fernoxone against *Dendrophthoe falcata* on various hosts. For example, at the dosages suggested by Kadambi, CuSO_4 proved extremely toxic to the mistletoe but invariably killed the branches of the hosts (*Callistemon lanceolatum*, *Achras sapota*, *Tectona hamiltoniana*, and *Citrus medica*). Injections of NaClO_3 at rates of $\frac{1}{128}$ oz. [sic] were very effective in controlling mistletoe on *C. lanceolatum* and *T. hamiltoniana* without doing appreciable damage to the hosts, but *A. sapota* and *Psidium guajava* were killed outright.

A small host-injection trial was also made in Ceylon in 1954 to control *Dendrophthoe falcata* on *Artocarpus integrifolia* of 3-4 ft. girth [59]. Various dosages of CuSO_4 , $\text{Na}_2\text{B}_4\text{O}_7$, and 2,4-D were applied, separately and in mixture, via six circumferential stem holes per tree. The experiment was not designed for statistical analysis, but results indicated that $\text{Na}_2\text{B}_4\text{O}_7$ affected neither host nor parasite, and that heavy doses of both CuSO_4 and 2,4-D were toxic to both parasite and host. The best compromise results were obtained with a combination of three $\frac{1}{2}$ -g. cartridges of 2,4-D plus three 4-g. cartridges of CuSO_4 ; this treatment partially killed out the parasite without affecting the host.

In Australia, a large body of information on mistletoe control by stem injection has been built up by the Division of Plant Industry, C.S.I.R.O., and the Forestry and Timber Bureau. Their findings refer only to Eucalypts as hosts, and mainly to *Amyema pendula* as parasite, in the Canberra area. Summarized, these findings are as follows. Organic poisons are more effective than inorganic. Of 18 inorganic poisons tested up to about 1950, CuSO_4 was the best, but killed only some 50% of the mistletoes. 2,4,5-T was only fairly effective, and methoxone, *p*-chlorophenoxyacetic acid, β -naphthoxyacetic acid, α -naphthylacetic acid, and 2,4,6-trichlorophenoxyacetic acid were poor. 2,4-D acetaldehyde bisulphite and 2,4-D ethyl phosphate were valueless. The triethanolamine salt of 2,4-D has given very good results, and has been quite extensively used in experiments, but the most promising material tested so far is 2,4-D hydrazine, which acts more quickly than the triethanolamine salt of 2,4-D. 2,4-D + 2,4,6-T, and 2,4-D + $\text{Na}_2\text{B}_4\text{O}_7$ have also given kills as good as those with 2,4-D alone.

Autumn is the best time for treatment, and one or two years may pass before the mistletoe is completely killed; the hosts may suffer partial, temporary defoliation. The injection holes should number one for every inch of tree diameter, and should be spaced evenly round the tree. They can be made with a $\frac{3}{4}$ -inch bit (or possibly a punch), should be bored at as steep an angle as possible, and should be just deep enough to hold the dose. Dosage varies with tree size and season, and probably with locality and tree species. Using a few deep holes instead of several shallow ones increases injury to the host crown and decreases the kill of mistletoe. Trees should not be treated during drought or when the soil is waterlogged. The maximum concentration of soluble 2,4-D that can be used without causing injury round the holes is 10% 2,4-D in 10% triethanolamine. 2,4-D injections in *Eucalyptus polyanthemos* cause increased diameter growth for a short period, usually not more than a year; this increase is very localized near the point of injection and is independent of the subsequent general increase following the death of the parasite; most of the increased growth occurs in the bark, though abnormal wood elements are also formed. Eucalypts become neither more susceptible nor more immune to the chemicals after repeated doses; a second treatment can kill or injure most of the surviving parasites without unduly harming the hosts. Some trees freed of mistletoe soon get re-infested.

The general standard of control has been a kill of 70-90% of the mistletoes and some 5% of the hosts with the first treatment, and a kill of about 50% of the remaining mistletoes with a second treatment a few years later. The proponents of the system believe that reasonable commercial control, as would be of use in practical forestry, can be obtained [3, 4, 8, 9, 11, 12, 15, 16, 30, 31, 44].

After testing the injection method on a wide variety of Eucalypts infected mainly by *Amyema miquelii*, Hartigan found that the results, though promising, were not such as to warrant adoption of stem injection as a routine practice on a commercial scale [35]. The validity of this conclusion has been challenged, however, because the injection holes were fewer and deeper than is recommended, the hosts and mistletoes were ones for which no previous experience was available, and the results were assessed too quickly [32].

The principal disadvantage of injection via holes is the time, trouble and expense of boring the holes,

especially in hardwoods. Application of the chemicals via axe-cuts appeared promising as a large-scale technique [11], and the general tendency recently in Australia has been to develop this variant of the injection method. To speed up applications, a modified Biltmore stick has been developed, from which one can read off the dose per tree, the number of cuts required per tree, and the number of "shots" of poison per cut. An axe with the blade ground down to 1½–2 inches wide has proved suitable for making the cuts, and a drenching gun for the actual application. As axe-cuts are somewhat less effective than bored holes, slightly larger doses are used. In a trial using 10% 2,4-D amine to control *Amyema miquelii* and *A. pendula* on *Eucalyptus polyanthemos* and *E. melliodora*, some 700 trees (of mean diameter 18 in.) on 50 acres were treated at a cost of ca. 6d. per tree, about one-half of this being for labour and one-half for the poison. In dry sclerophyll forest, 88% of the mistletoes and 21% of the hosts were killed; in woodland, 38% of the mistletoes and 6% of the hosts [12, 22]. Hartigan [35] has tried a modification of the injection method by incorporating the 2,4-D amine salt into a paste of carboxy methyl cellulose and applying it to incisions made at the base of the tree. Results were promising, but are as yet incomplete.

5. SUMMARY

Control of these widespread parasites by pruning and modified management systems is possible, though pruning is likely to be very arduous and expensive, especially with tall trees. Isolation zones may be of importance under certain conditions, but much research still needs to be done to determine the optimum silvicultural treatment in each case. Biological control by birds and mammals is generally regarded as being out of the question, and insects do not offer much promise, but it is conceivable that some of the parasitic fungi may be used successfully. In chemical control, which is the method now attracting most attention wherever mistletoe is a serious problem, stem injection techniques appear to have definite advantages over spraying, and organic preparations, particularly 2,4-D, give better results than inorganic poisons. Treatments must be worked out by trial and error for each host/parasite combination and set of conditions, but several guiding principles have already been established.

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ABSTRACT SECTION

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0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general regional accounts see section 90

Translations

See Nos. 2864, 2965, 3166, 3556, 3573, 3602, 3651, 3676, 3779, 3792, 3811-2.

0(033). Encyclopaedias

2657. Naučný slovník lesnický. III. [Forestry encyclopaedia. Part III [R-Ž.]] Československá Akademie Zemědělských Věd, Prague. 1960. pp. 1685-2638. [Cz.] Price Kčs. 135. I.F.B. [Cf. F.A. 21 No. 2617.]

0(038). Dictionaries

See Nos. 3545, 3660.

0(048.1). Bibliographical Lists

See Nos. 2697, 2874, 3136, 3142, 3213, 3239, 3317, 3674, 3958.

0(05). Periodicals. Directories

See also No. 3138.

2658. *Radovi na istraživanju topola*. Jugoslovenska nacionalna komisija za topolu, Belgrade.

No. 1, 1960, contains 4 articles totalling 126 pages. The series will report on Poplar research in Yugoslavia. Abbreviation in F.A.: *Rad. Istraž. Topola Jugosl. Nac. Kom. Topolu*.

0(084.3/4). Maps. Atlases

2659. Sierra Leone—[map of] land use. Rhombe. Sheet A. Survey and Lands Department, Sierra Leone. 1960. 1 sheet. Scale 1 : 16,000. Price 3s. 6d.

Types of land use shown include woodland, stands of wild Oil Palm, Mangrove swamp and swamp forest.

2660. Sierra Leone. [Maps of] land use. Little Scarries, Sheets A and B. Ribbi-Bumpe, Sheet B. Rhombe, Sheet F. Directorate of Overseas Surveys, Tolworth. 1960. 4 sheets. Price 3s. 6d. each sheet. Scale: Little Scarries and Ribbi-Bumpe 1 : 40,000; Rhombe 1 : 16,000.

2661. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 14. Uele. A.—sols. B.—utilisation des sols. [Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 14. Uele. A.—Soils. B.—Land use.] Institut National pour l'Étude Agronomique du Congo

Belge (I.N.É.A.C.), Brussels. 1960. pp. 128 + 7 maps. 15 refs. [F.]

Consists of an explanatory booklet (R. Frankart) and the soil and land-use maps (scale 1 : 40,000).

2662. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 15. Kasai. A.—sols. B.—végétation. [Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 15. Kasai. A.—Soils. B.—Vegetation.] Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1960. pp. 76 + 8 maps, 1 chart. 20 refs. [F.]

Consists of an explanatory booklet (P. Gilson and L. Liben), and the soil and vegetation maps (scale 1 : 50,000).

2663. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 16. Dorsale du Kivu. A.—Sols. B.—Végétation. C.—Utilisation des sols. [Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 16. The Kivu ridge. A.—Soils. B.—Vegetation. C.—Land use.] Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1960. pp. 124 + 2 plates, 4 maps. 13 refs. [F.]

Consists of an explanatory booklet (A. Pérot and A. Léonard), the soil map (2 sheets) (A. Pérot and J. M. Berce), the vegetation map (A. Léonard) and the land-use map (A. Pérot). One sheet of the soils map is scale 1 : 50,000, all the rest are 1 : 500,000.

2664. Carte des sols et de la végétation du Congo et du Ruanda-Urundi. 17. Région de Yanonge-Yatolema. A.—Sols. [Map of the soils and vegetation of the Congo and Ruanda-Urundi. 17. Yanonge-Yatolema region. A.—Soils.] Institut National pour l'Étude Agronomique du Congo (I.N.É.A.C.), Brussels. 1960. pp. 28 + 1 map. 16 refs. [F.] 1 tbl.

Consists of an explanatory booklet (A. van Wambeke) and the soils map, scale 1 : 100,000.

2665. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. Congo Belge et Ruanda-Urundi. A.—Sols. [Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. The Belgian Congo and Ruanda-Urundi [as a whole]. A.—Soils.] Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1960. pp. 84 + 10 photos, 2 maps. 40 refs. [F.]

Consists of an explanatory booklet (C. Sys) and the soils map, scale 1 : 5,000,000.

2666. **Federation of Rhodesia and Nyasaland.** [Map of] Nyasaland. Sheet 1234 C3 & 4. Directorate of Overseas Surveys, Tolworth. 1960. 1 sheet. Scale 1 : 50,000.

Topography, land use, etc.

2667. **Mauritius—land use [map].** Directorate of Overseas Surveys, Tolworth. 1960. 1 sheet. Price 1s. Scale 5 miles to 1 in.

Includes: forests, plantations, woodlands, grasslands, savannas; crown forests and mountain reserves; tea; sugar; etc.

2668. [Map of] major land uses in the United States. Agricultural Research Service, Department of Agriculture, Washington. 1958. 1 sheet. Price 75 cents. Scale 1 : 5,000,000.

0 - - 011. Terminology. Nomenclature

See Nos. 3545, 3660.

0 - - 014. Classification

See No. 2767.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

See also No. 2914.

2669. **HILLS, G. A. Regional site research.** *For. Chron.* 36 (4), 1960 (401-23). 28 refs.

Soil features, such as texture, mineral composition and moisture, and other features of land, such as topography, vary in their effect on forest growth, according to regional climate. In Ontario, studies of land/forest relationships are conducted within the framework of site regions. These are regions within which the effect of macroclimate is assumed to be relatively uniform, since they have been established by comparing the natural succession of vegetation on similar land forms, rather than from meteorological data. From the standpoint of forestry, the most pertinent feature of a site region is that it is an area in which similar responses may be expected from similar natural disturbances and forestry practices within similar combinations of land forms and forest types. Regional site research embraces, within each site region: (a) The establishment of land types and the description of the physiographic site types occurring within each land type. (b) The description of the forest types coinciding with stages of succession within each physiographic site type. (c) The establishment of soil types coinciding with physiographic site types and major vegetation controls; also the establishment of variations in soil types resulting from differences in forest succession and forestry practice. (d) The evaluation of each physiographic site type for producing forest and other crops. Thus the aim of regional site research is (1) to describe the various physiographic conditions occurring in a site region so that foresters and land-use planners may recognize them, and (2) to provide information regarding forest distribution, forest succession and the capability of these physiographic site types to produce forest and other crops, which information may aid these people in designing silvicultural experiments, in making forest management decisions, or in planning alternative uses of the land. Examples have been drawn from the site regions of Ontario to illustrate the principles and methodology of regional research. *From author's summary.*

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

2670. **KOREL'SKIĬ, G. N.** K rasčetu osveščennosti prjamymi solnečnymi lučami kron derev'ev i počvy v drevostoe. [Calculation of direct solar illumination of tree crowns and the floor in a stand.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (164-5). [Russ.]

Presents brief notes on the problem, and a formula for finding the area of foliage subjected to direct radiation.

2671. **BAUMGARTNER, A.** Die Lufttemperatur als Standortsfaktor am Gr. Falkenstein. 1. Mitteilung. [Air temperature as a site factor on the Grosser Falkenstein. 1.] *Forstwiss. Cbl.* 79 (11/12), 1960 (362-73). 15 refs. [G.g.e.]

[Cf. F.A. 22 No. 1317.] Discusses temperature as a growth factor and as a means of delimiting site units, and reviews various experimental techniques used in temperature measurements. Results of such measurements on the W. slope are analysed.

2672. **REIMANN, L. F.** Mountain temperatures from the San Dimas Experimental Forest. *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 36, 1959. pp. 33.

Data to illustrate vertical distribution and variation of air temperature on southern slopes of the San Gabriel Mountains in California.

111.5. Wind

See No. 2678.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

2673. **KUDRJAVCEV, F.** Simple evaporimeter for ecological studies. *Res. Note (For. Lds. Res.) Ore. For. Res. Cent.* No. 43, 1960. pp. 8.

Describes, with a number of photographs, a simple apparatus designed from ideas originated by Piché [cf. F.A. 14 No. 2251], and easily constructed from plastic bars, corks, heavy filter-paper and household cement.

2674. **REIMANN, L. F.** Mountain evaporation data from the San Dimas Experimental Forest.

Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta. No. 35, 1959. pp. 14.

Tabulated data from stations at 1500, 2800, 4350, and 5100 ft., in openings in the chaparral.

2675. DAWKINS, H. C. **Weekly measurement of rainfall.** *Tech. Note For. Dep. Uganda No. 84 (60), 1960. pp. 2.*

Two standard rain gauges exposed together at each of two stations for 95 and 44 weeks (31 rainless) allowed of 108 comparisons of (a) totals of 7 days' readings and (b) one weekly reading. The differences between (a) and (b) were not more than the usual run of observational error and the loss in (b), in the region studied, is unlikely to be >1 in./year.

2676. REIMANN, L. F., and HAMILTON, E. L. **Four hundred sixty storms: data from the San Dimas Experimental Forest.** *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta. No. 37, 1959. pp. 101.*

Rainfall quantities by days, maximum rainfall rates by storms, and attendant storm data are given for the 25-year period 1933-58.

111.8. Climatology. Climate and Microclimate

See also Nos. 2669, 2939, 3069, 3108.

2677. FAIRBAIRN, W. A. **Climatic zonation in England and Wales.** *Repr. from International Journal of Bioclimatology and Biometeorology, Leiden 4 (Part 2, sect. C) 1960. pp. 17 + 2 gphs., 5 maps. 14 refs. [E.]*

[Cf. *F.A.* 17 No. 2376.] Describes the methods by which England and Wales are divided into climatic sub-zones in relation to forestry and other forms of land use, and presents a chart showing the sub-zone boundaries.

2678. KOCH, H. G. **Der Wind als Standortsfaktor im Klimamosaik des Mittelgebirges. [Wind as a site factor in the local climatic patterns of the mountain ranges of Central Germany.]** *Arch. Forstw. 9 (10), 1960 (901-42 + 1 map). 16 refs. [G.g.russ.e.]*

Describes observations on forests and vegetation on the southern, windward side of the Thüringer-Wald/S.-Harz range, which suggest that the typically dry sites found in the region, despite general high precipitation, are due to desiccation by wind, that exposure to wind is of greater importance than temperature, and that topography greatly modifies the effect of prevailing winds. These observations are supported by measurements of temperature, wind, precipitation and soil moisture on N. and S. slopes, exposed heights and valley bottoms in the southern, windward part of the range, where valleys are generally narrow with little wind, and the more open, plateau-like, leeward north, where winds are much stronger.

114. Soil. Soil Science

See also No. 2870.

2679. DUCHAUFOR, P. **Précis de pédologie. [A summary of pedology.]** Masson & Cie, Paris. 1960. pp. 438 + 16 plates + 1 dgm. 21 pp. of refs. [F.]

An expanded version of an earlier treatise [cf. *F.A.* 18 No. 1226] in three parts: Soil properties; Genesis and evolution of soils; and (new) Applied pedology, including soil conservation, amelioration and fertilization of forest soils, soil mapping, and soil analysis.

2680. GROENEWOUD, H. VAN. **Methods and samplers for obtaining undisturbed soil samples in the forest.** *Soil Sci. 90 (5), 1960 (272-4). 20 refs. O.R.E.*

The sampler (described) consists essentially of a cutting cylinder forced into the soil by screwing it through a threaded boss or guide cylinder. The sampler worked very satisfactorily on all except very sticky soils. Roots $\leq \frac{1}{8}$ in. diam. were cut through without notably disturbing the sample.

114.1. Soil Physics

See Nos. 2691-2, 2698, 3064, 3075, 3239-40, 3424, 3469.

114.2. Soil Chemistry

See also Nos. 2685, 2687-8, 2700-5, 2712, 2861, 3064, 3096, 3239-40, 3247, 3424, 3719.

2681. BATES, J. A. R.; BATES, J. A. R., and BAKER, T. C. N. **Studies on a Nigerian forest soil. I. The distribution of organic matter in the profile and in various soil fractions. II. The distribution of phosphorus in the profile and in various soil fractions.** *J. Soil Sci. 11 (2), 1960 (246-65 + 6 photos). 46 refs.*

In a mid-slope soil under lowland rain forest [cf. *F.A.* 15 No. 3398], typical of the red concretionary variant of the two series with a sandy horizon overlying one of gravel at 7-50 in., the C content, C/N ratio, pH and total P fell away sharply at 2 in., the main root growth and worm activity being confined to the top few inches. The soil is described in detail.

2682. WELLS, N. **Total elements in topsoils from igneous rocks: an extension of geochemistry.** *J. Soil Sci. 11 (2), 1960 (409-24). 16 refs.*

Spectrographic analyses show a loss, under the high rainfalls of the S.W. Pacific, of Mn, Ca, Na, K, Sr, and Ba, resulting in a concentration of Fe, Ti, Mo, Ga, and V, and little or irregular change in Al, Zr, Cr, Ni, Co, Mn and Cu. The leaching of elements in soils derived from acidic rocks can be modified by litter from vegetation such as Kauri (*Agathis australis*). In strongly podzolized, strongly weathered, topsoils with a Kauri cover, the elements normally concentrated under climatic weathering have been removed by vegetative leaching, and Si is the residual element. *From author's summary.*

2683. KUBOTA, J., and BEESON, K. C. **The study of cobalt status of soils in Arkansas and Louisiana using the Black Gum as the indicator plant.** *Proc. Soil Sci. Soc. Amer. 24 (6), 1960 (527-8). 5 refs.*

Co concentrations in *Nyssa sylvatica* leaves and broomsedge were consistent with previous findings for coastal Bermuda grass. [Cf. *F.A.* 20 No. 2702.]

2684. ASSING, I. A. Osobennosti gumusoobrazovaniya v gornyy počvah Severnogo Tjan'-Šanja. [Features of humus formation in the mountain soils of the Northern Tien Shan.] *Počvoved.* 1960 (12), (16-22). 8 refs. [Russ.russ.e.] A.P.B.

Tabulates humus contents and analytical data on the humus of soils in an altitudinal sequence from alpine meadow soils (3280 m. alt.) down to mountain-forest dark-grey soils (1400 m. alt.) under *Picea schrenkiana*.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 2682, 2689-92, 2702-6, 2712, 2715, 3469.

2685. KAURIČEV, I. S., and NOZDRUNOVA, E. M. Učet migracii nekotorykh soedinenij v počve s pomošč'ju lizimetričeskikh hromatografičeskikh kolonok. [Estimating the migration of certain compounds in the soil with the help of [combined] lysimeter/chromatographic columns.] *Počvoved.* 1960 (12), (30-5). 6 refs. [Russ.russ.e.] A.P.B.

Describes the method, which involves the insertion of special chromatographic columns immediately beneath the various horizons in the soil profile, and its use in studying the migration of Fe compounds in virgin podzolic and sod-podzolic soils of the forest/meadow zone. It is deduced that Fe leaching has been widespread in the central taiga subzone, whereas in the S. taiga subzone it has been pronounced only in moist mossy forests where there has been periodic seasonal excess moisture [cf. *F.A.* 21 No. 1335]. A list of adsorbents which may be used for preparing the chromatographic columns is given.

2686. BUTUZOVA, O. V. O vlijanii drevesnykh porod na mikrorel'ef i kompleksnost' počv. [Influence of woody species on micro-relief and mosaic variations of soils.] *Bot. Ž.* 45 (5), 1960 (707-9). 6 refs. [Russ.]

Two trenches 30 m. long were dug in Spruce/Pine forest in the Vologda region: one from a Spruce 170 years old to a Pine 250 years old, and the other intersecting the first almost at right angles. Changes in soil morphology (illustrated) were studied along the profiles of the trenches. It was concluded that it is impossible to determine the process of soil formation in the taiga zone without taking micro-relief into account, and that isolated soil sections cannot give a correct picture of the soils of the area studied. It is suggested that the studies be continued in order to provide a clear picture of the change in micro-relief in relation to the forest type and the age of the trees, and of the influence of micro-relief on the soil mosaic.

2687. MIGUNOVA, E. S. The character of soil formation under the cover of broadleaved tree stands in chernozem zone. *Naučnye Doklady Vysšej Školy, Biologičeskie Nauki* No. 1, 1960 (177-83). [Russ.] From *abstr. in Chem. Abstr.* 54 (22), 1960 (25431). P.R.

Presents results of a study made in 1950-58 of soil formation under old plantations and natural broadleaved stands in the chernozem region. Laboratory

tests showed increases of N and humus reserves in forest soils, and a slight fall in pH of the top horizons from 7.35 to 6.98. All processes of chernozem soil formation were found to be still continuing under broadleaved forest cover.

2688. JARO, Z. Az erdei alom. [Forest litter.] *Erdő* 8 (8), 1959 (302-7 + smries. in suppl.). [Hu. russ.g.]

Studies show that in parts of Hungary having a humid climate, it is desirable to maintain, in addition to an accumulation of litter, a low C/N ratio for its rapid decomposition, for which the amount of Ca present is generally decisive: in moderately humid climates, the emphasis is on the accumulation of litter, and a high C/N ratio works favourably, Ca playing here only a modest role. Robinia and Hornbeam are soil improvers only where accelerated litter decomposition is required (under conifers). In pure stands of either species, the humus accumulation is reduced and soil fertility diminishes. Species of Lime and Maple are best for mixtures since they give a rich litter with a moderate decomposition rate and their nutrient mobilization is good.

114.4. Soil Classification. Soil Types

See also Nos. 2661-5, 2684-5, 2687, 2702, 3064.

2689. GANSEN, R. Versuch einer vorläufigen genetischen Gliederung von Kultur- und Wirtschaftsböden. [Attempt at a preliminary genetic arrangement of cultivated soils and soils where the natural vegetation is exploited.] *Z. PflErnähr. Düng.* 87 (3), 1959 (201-12). 1 ref. [G.g.] O.R.S.

The soils are classified in four groups. Notes are given for each soil (including types under forest or plantations) on: the kind of process at work; the former natural soil; the kind of cultivation or use; changes compared with the natural soil; world regional distribution.

2690. MARČENKO, A. I. K karakteristike počv "Kargopol'skoj suši". [The soils of the "Kargopol Causeway".] *Počvoved.* 1960 (11), (24-31). 9 refs. [Russ.russ.e.] A.P.B.

A mechanical and chemical analysis of the soils, developed over limestones. Under Spruce, podzolization is taking place; under (temporary) broadleaved forest on old farm land, the soil-forming processes are of the sod type.

2691. KUNDLER, P. Zur Kenntnis der Rasenpodsole und grauen Waldböden Mittelrusslands im Vergleich mit den Sols lessivés des westlichen Europas. [The sod podzols and grey forest soils of central Russia compared with the sols lessivés of W. Europe.] *Z. PflErnähr. Düng.* 86 (1), 1959 (16-36). 28 refs. [G.g.] O.R.S.

The sod podzols of the mixed forests of the central Russian plain and the sols lessivés of W. Europe were found to be closely similar in general profile, humus and clay distribution, sorption relations, and structure. The origin of differences in texture of sod podzols and grey forest soils was studied. [Cf. *F.A.* 21 No. 2649; 22 No. 1139.]

2692. SEMINA, E. V. Serye lesnye počvy Krasnojarskoj lesostepi i nekotorye voprosy ih genezisa. [Grey forest soils of the Krasnojarsk forest-steppe, and some problems of their genesis.] *Počvoved.* 1961 (1), (29-39). 19 refs. [Russ.russ.e.] A.P.B.

The grey forest soils are largely under Birch and Birch/Pine (sometimes with Aspen), with a well developed, relatively dense and tall herbaceous cover; the parent material is loose Quaternary clayey deposits. Data are tabulated on the chemical and physical composition of three such soils, showing various degrees of podzolization under Pine/Birch. Apart from the general features of the soil type, these soils also display regional characteristics, viz. high humus content, considerable leaching of carbonates, and seasonal gleying (connected with the prolonged seasonal duration of a frozen layer deep in the profile). At the moment (owing to the milder climate, and man's influence through fellings), podzolization is becoming less evident, and the sod type of soil formation is gaining ground.

2693. KALINIĆ, M. Prilog poznavanju šumskih tala Bosutskog područja. [Forest soils of the Bosut region.] *Šum. List* 84 (9/10), 1960 (317-30). 17 refs. [Croat.e.]

A survey of the soils of the main forest area in the Sava basin, N. Yugoslavia. The forests consist chiefly of *Quercus robur* with *Fraxinus angustifolia* and *Ulmus campestris*, and belong to the *Querceto-Genistetum elatae*.

2694. BADEN, W. Zwei Jahrzehnte Moorkunde in Deutschland. [Two decades of bog studies in Germany.] *Zeitschrift für Kulturtechnik, Berlin* 1 (1), 1960 (2-25). 263 refs. [G.]

A review of literature.

2695. WILDE, S. A., and KRAUSE, H. H. Soil-forest types of the Yukon and Tanana valleys in sub-arctic Alaska. *J. Soil Sci.* 11 (2), 1960 (266-79 + 6 photos). 14 refs.

Based on an extensive survey of 200 areas and a detailed examination of soil and forest composition and increment on 37 sample plots, a description is given, with profile and data on soil properties, of skeletal (lithosols and regosols), alluvial, melanized raw humus, micro-podzols, half bog, low moor peat, high moor bog, and tundra forest soils carrying White and Black Spruce, Tamarack, Paper Birch, Aspen, Tacamahaca Poplar with Sitka Alder, Willows, Alaska Rose etc. and mosses and lichens (named). Spruce can yield 15,000 bd. ft./acre on loessal uplands and permafrost-free terraces. A growth of 0.3 cords/year on skeletal soils is attributed to occult precipitation due to day/night temperature differences.

2696. KLINGE, H. Ergebnisse bodenkundlicher Standortserkundungen in El Salvador, Zentralamerika. [Pedological site studies in El Salvador.] *Mitt. BundesforschAnst. Forst- u. Holzw.* No. 47, 1960. pp. 9 + 2 tbls. 27 refs. [G.]

Discusses and tabulates the more important site categories, briefly describing topography, soils, parent material, altitudinal zone, extent, natural

vegetation and present land use. Forest formations include mangroves, moist tropical forest (*Ficus*, *Ceiba*, *Bactris* spp. etc.), deciduous dry forest (*Myroxylon pereirae*) in the hot lowlands, Oak and Pine (*Pinus occarpa*) forests in the temperate zone, and mist forest (Oaks dominant) in the cool mountain zone. There is considerable correspondence between the distribution of soils and vegetation.

2697. Bibliography on culture of laterite and lateritic soils (1940-1957). *Bibliogr. Bur. Soils, Harpenden* No. 234, 1959. pp. 8.

Comprises 35 abstracts, a number of which refer specifically to forests on such soils.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 2669, 2683, 2688, 2695, 2705-6, 2737-8, 2853, 2861, 2886, 2902-3, 2913, 3096, 3239-40, 3469.

2698. BURNS, P. Y. [Editor]. Southern forest soils. *Proc. 8th For. Symp. La. Sch. For.* 1959. pp. 9 + 132. Many refs.

A symposium for the practical forester, summarizing, in 16 papers, recent research and experience on soil/growth relationships, site evaluation, fertilizing, and soil moisture problems, including a paper by Applequist [see *F.A.* 22 No. 2853] and one on soil-water shortages and a means of alleviating resulting influences on Southern hardwoods (*W. M. Broadfoot*), indicating that 6-12 in. of water impounded in autumn and drained in April alleviated Sweetgum blight [cf. *F.A.* 20 No. 4963] and increased diameter growth of most species, but that continuous flooding killed most of them in 2 to 4 years.

2699. RUNOV, E. V., and ENIKEEVA, M. G. Toksikoz černozemov pod lesnymi nasaždenijami v suhoj stepi. [Toxicity of černozems under forest stands in the dry steppe.] *Soobšč. Inst. Les.* No. 11, 1959 (27-40). 18 refs. [Russ.]

The germination of wheat and Oak and the presence and/or survival of *Azotobacter*, were used as criteria of toxicity (sickness) in soils under plantations, and in some virgin or cultivated soils at Derkul (S.E. Ukraine). [No chemical soil analyses are reported.]

114.6. Soil Biology

See also Nos. 2900, 3239-40, 3247.

2700. BERNIER, B. Observations sur le métabolisme respiratoire de quelques humus forestiers. [The respiratory metabolism of some samples of forest humus.] *Contr. Fonds Rech. For. Univ. Laval* No. 5, 1960. pp. 44. 58 refs. [F.e.]

Deals with the application of the Warburg manometric technique to the measurement of the respiratory activity of raw-humus samples from the boreal forest region, and reports some observations on the factors that affect respiration—mode of conservation, humidity, storage and temperature of samples, sampling season. Samples of different types of humus were collected from two forest sites at intervals during the growing season, and their respiration measured. Both sites were mainly *Abies*

balsamea but one was a *Dryopteris/Oxalis* and the other a *Hylocomium/Oxalis* type. Results indicated a fairly uniform respiratory pattern throughout the summer, except in mulls or raw humus from xeroserers. Respiration was much higher on the non-fertile sites (*Dryopteris/Oxalis*), irrespective of the organic-matter content. It seems likely that the nature and the degree of evolution, rather than the quantity, of organic matter affect respiration. The effect on respiration of added substrates, e.g. starch, pectic acid or gelatin was also studied.

2701. PARŠEVNIKOV, A. L. K karakteristike biologiĉeskoj aktivnosti lesnyh počv Kol'skogo poluostrova. [Features of the biological activity of the forest soils of the Kola peninsula.] *Počvoved.* 1960 (12), (95-7). 16 refs. [Russ.e.] A.P.B.

The biological activity of the soils was assessed by measuring the amount of CO_2 produced by the soil (in mg./sq. m./hour), on the following sandy podzol sites: (1) *Piceetum myrtillosum*; (2) a clear felling in (1); (3) Pine with mosses and lichens; and (4) a clear felling in (3). On all four sites, biological activity was determined with the litter-and-humus (a) largely *in situ* or (b) removed. Data are tabulated. Activity was greatest at the end of July, was less on (b) than on (a) plots on all four sites, and was greater on the whole in (1) and (2) than in (3) and (4). The CO_2 produced in July and early August was not less than in more southerly parts of the forest zone [cf. *F.A.* 17 No. 1132], but in the Kola peninsula conditions favourable for such intense activity last for only a short period in the summer.

2702. ZONN, S. V., and LI, C.-K. K karakteristike ěnergetiki biologiĉeskih processov v tropiĉeskih lesnyh počvah. [The characteristics of biological processes in tropical forest soils.] *Počvoved.* 1960 (12), (1-15). 5 refs. [Russ.e.] A.P.B.

The investigations were made in Yunnan province, 10-12 km. from the Burmese frontier, in (a) evergreen forest of *Gironniera subaequalis*, *Xanthophyllum* sp., *Knema linifolia* etc. with fern (*Pleocnemia*), on a yellowearth, and (b) secondary Bamboo forest (*Phyllostachys* sp.) on a red earth. Data are tabulated on the accumulation and breakdown of, and CO_2 production from, the litter-and-humus layer, and the variations of CO_2 and O_2 in the soil air, throughout the various seasons of the year. Biological processes were more active in (a) than in (b) soils, and for most of the year were of an aerobic type in (a) but anaerobic in (b). Under (b) there is an increase of clay content in the layers where CO_2 accumulates, a higher pH, fewer exchangeable cations (especially H), and considerably more allitization of minerals.

2703. ZÖTTL, H. Dynamik der Stickstoff-mineralisation im organischen Waldbodenmaterial. I. Beziehung zwischen Bruttomineralisation und Nettomineralisation. II. Einfluss des Stickstoffgehaltes auf die Mineralstickstoff-Nachlieferung. III. pH-Wert und Mineralstickstoff-Nachlieferung. [The N-mineralization process in the organic part of forest soil. I. The relation between gross and net mineralization. II. The influence of N content on the subsequent yield of mineral N. III. The pH

value and the yield of mineral N.] *Plant & Soil* 13 (2; 3), 1960 (166-82; 183-206, 207-23). 133 refs. [G.g.e.]

(I) [Cf. *F.A.* 19 No. 1721; 20 No. 1803; 21 No. 19; 22 No. 1333.] Samples of Bavarian forest soil were incubated for 16 weeks, the production of CO_2 per kg. of C being accepted as a measure of gross N mineralization (x) and the amount of $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ in p.p.m. of dry substance as a measure of net (or accumulated) N mineralization (y). Samples were treated by (a) adding sucrose; (b) previously improving microbial conditions by liming the soil; (c) grinding the humus. The x/y ratio depends on the composition of the organic matter and the living conditions of the microbe population. With plentiful N-free, available organic matter, as in (a), a high x and low y occur. Treatment (b) can increase N immobilization during high x to such an extent as to set up a "biological N blockade", exemplified by the lag of N accumulation at the start of incubation. Treatment (c) results in marked increases of x, especially with litter. The change in y depends on the N content becoming available by comminution. (II) The yields of mineral N ($\text{NH}_4\text{-}$ and $\text{NO}_3\text{-}$) show some dependence on total N in the organic matter (C/N ratio) but this correlation is directly influenced by "microbial decomposability". Only when materials of similar microbial decomposability are compared is the correlation close. In this respect there was good comparability between raw humus and moder, in both of which it was found that the higher the mineralization, the lower was the C/N ratio. Mull and humus from the H-layer and A_1 horizons of raw humus showed very low mineralization rates with low C/N, ascribable to a high content of stable humin substances. In moder the F-layer often showed very high rates; the highest gross and net mineralization values appeared in L-layer material. Additions of mineral N during incubation had no effect on the mineralization of organic N except $\text{NO}_3\text{-N}$ in non-nitrifying raw humus. (III) Various raw humus and moder samples showed a weak positive correlation between pH value and mineral N accumulation. In mull samples this was negative. The lower the pH value the greater the C/N ratio. During incubation pH increased with $\text{NH}_4\text{-}$ and decreased with $\text{NO}_3\text{-}$ accumulation. Liming of mull hardly altered x and y, but in very acid raw humus and moder caused a considerable increase of x in the first weeks of incubation. Liming effects are further detailed.

2704. EHRHARDT, F. Stickstoffnachlieferung aus Waldhumus in verschiedenen Höhenlagen der Tiroler Alpen. [Production of available N in forest humus at different altitudes in the Tyrolean Alps.] *Mitt. St. Forstverw. Bayerns* No. 31, 1960 (52-8). [G.] [See *F.A.* 22 No. 20.]

2705. PARKINSON, D., and WAID, J. S. [Editors]. The ecology of soil fungi. An international symposium. Liverpool University Press, Liverpool. 1960. pp. xi + 324. Many refs. Price 35s.

Contains papers read at Liverpool, with discussions, under the following main headings: Methods for isolation and estimation of activity of

fungi in soil (5 papers); The growth of fungi in soil (6); Antagonisms in soil (5); Dynamic equilibria of soil populations (4); Problems associated with the decomposition of organic matter in soils (4); and The physiology of soil fungi (4). Papers more particularly of forestry interest are: On the growth of fungi in soil (*J. S. Waid*); Growth of fungi in some forest and grassland soils (*R. H. Thornton*) [including a former Oakwood site in Nottinghamshire now under Oak, Pine, or *Calluna*, and a former forest site in New Zealand now under *Beilschmiedia tawa* or pasture]; Inhibition of fungal growth in soils (*C. G. Dobbs et al.*) [including research on woodland and other soils, and seasonal fluctuations in them—cf. *F.A.* 20 No. 4089]; A study of the fungal microflora of the rhizosphere of Fir (*W. Maliszewska et al.*) [see *F.A.* 21 No. 30]; and Microbiological problems associated with the decomposition of humic acid (*N. A. Burges et al.*) [experiments with humic acid from a podzol in Delamere Forest, Cheshire].

2706. DAVIS, B. N. K. Soil fauna in relation to soil formation and fertility. *Nature, Lond.* 189 (4762), 1961 (367–8).

Summarizes a 3-day colloquium held at the British Museum of Natural History in Oct. 1960, at which papers were read on the following subjects: Soil fauna in relation to pedology (*D. A. Osmond* and *P. Bullock*); The mechanics of earthworm activity (*F. Raw*); Distributional patterns of soil mites in pure and mixed conifer stands (*J. Hobart*); Feeding behaviour of oribatid mites (*A. J. Hayes*); Comparative rates of disappearance of Oak and Ash leaves on contrasting sites (*K. L. Bock*) [cf. *F.A.* 21 No. 3955].

2707. CROSSLEY, D. A., JR., and BOHNSACK, K. K. Long-term ecological study in the Oak Ridge area. III. The oribatid mite fauna in Pine litter. *Ecology* 41 (4), 1960 (628–38). 23 refs.

Reports an investigation into the abundance of the various oribatid species found in litter of *Pinus echinata* and *P. virginiana*, and local variation in numbers for these mites, both between and within similar stands of trees, in Tennessee.

2708. EITMINAVIČIŪTĖ, I. Rasprostranenie oribatidnyh kleščej v hvojnomo lesu. [Distribution of oribatids in coniferous forest.] *Liet. TSR Mokslų Akad. Darb. (Ser. C)* No. 3 (23), 1960 (69–76). 6 refs. [Russ.russ.lith.]

[Cf. *F.A.* 22 No. 53.] Tabulates data on the 70 species found in the six coniferous forest biotopes examined. More were found in Scots Pine forests than in Spruce, and most species were found in forest with a ground cover of mosses. The most abundant species were *Oppia neerlandica*, *Tectocephus velatus* and *Punctoribates punctum*.

2709. EITMINAVIČIŪTĖ, I. Rasprostranenie oribatidnyh kleščej v listvennom lesu. [Distribution of oribatids in broadleaved forest.] *Liet. TSR Mokslų Akad. Darb. (Ser. C)* No. 3 (23), 1960 (79–88). 6 refs. [Russ.russ.lith.]

[Cf. *F.A.* 22 No. 53.] Tabulates data on the 83 species found in the five broadleaved forest (mainly

Alnus glutinosa) biotopes examined. There was little difference in numbers of species between the biotopes. The most abundant species were *Scheloribates laevigatus*, *Notaspis punctatus*, *Pelops occultus*, and *Galumna lanceatus*. Oribatids were most frequent in coniferous forest and least in broadleaved forest, with coniferous/broadleaved forest intermediate.

2710. SHIGO, A. L., and YELENOSKY, G. Nematodes inhabit soils of forest and clear-cut areas. *For. Res. Note Ntheast. For. Exp. Sta.* No. 101, 1960. pp. 4. 1 ref.

A study was made on the Bartlett Experimental Forest in New Hampshire to determine whether there was a difference between the types and numbers of nematodes in the soils of (a) small clear-cut areas and (b) the adjacent forest. The 50 samples from (a) contained 24,933 nematodes vs. 15,525 in 50 samples from (b); 27% of those from (a) and 37% from (b) were stylet-possessing forms.

2711. STEGMAN, L. C. A preliminary survey of earthworms of the Tully Forest in central New York. *Ecology* 41 (4), 1960 (779–82). 10 refs.

Samples were collected from the following forest types: old field, Northern hardwoods, White Pine plantations, Red Pine plantations, Scots Pine plantations, White Cedar plantations, and Norway Spruce plantations. Earthworms were found in all except the last of these types; there were 10 species belonging to 7 genera.

2712. DRIFT, J. VAN DER, and WITKAMP, M. The significance of the break-down of Oak litter by *Enoicyla pusilla* Burm. Repr. from *Archives Néerlandaises de Zoologie, Leiden* 13 (4), [1959?] (486–92). 4 refs. [E.e.]

Presents data on litter consumption, assimilation and excretion, and on the differences between chemical contents of excreted pellets and microbial attack on them as compared with litter [cf. *F.A.* 20 No. 1383].

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 3067, 3123.

2713. CEL'NIKER, JU. L. O vlijanii rubok uhoda na transpiracionnyj rashod vlagi nasaždenijami stepnoj zony. [Effect of thinnings on the loss of water by transpiration in stands in the steppe zone.] *Soobšč. Inst. Les.* No. 11, 1959 (41–8). 7 refs. [Russ.russ.]

At Derkul, a plantation of Oak, *Fraxinus excelsior*, *F. pennsylvanica* (4/3/3), 14–16 years old, with rows of *Caragana arborescens* between the tree rows, was thinned as follows: (a) all the *C. arborescens* removed; (b) half the Ash and half the *C. arborescens* removed; (c) all the Ash and *C. arborescens* removed. Control plots (d) were untouched. The transpiration of the stands was then determined [cf. *F.A.* 16 No. 83]. It was found that thinning increased the rate of transpiration in the first few years, in years of average precipitation; in years with above-average summer rainfall the transpiration rate on the thinned plots was higher than

that on (d); in dry years thinning had very little effect on the transpiration rate. Thinning led to an increase in the weight of foliage per tree. The Oak grew best with treatment (b). With (a), most of the moisture was transpired by *F. excelsior*. Moisture conditions for the Oak were best with (c), but as this resulted in invasion by grass, which transpired ca. half of all the moisture lost, it is concluded that thinning should be spread over several years.

2714. HARA, M., TANAKA, K., and YAMANE, H. [Studies of soil erosion in denuded forest lands. (2nd report) Effects of vegetation on the quantity of soil loss and surface run-off.] *Transactions of the Tottori Society of Agricultural Science, Tottori* 12, 1960 (122-31). 7 refs. [Jap.jap.e.e.] C.G.B.

Two plots, on bare soil, were studied from 1954, and in 1958 one was planted with grass. Measurements in the first two years after planting showed very much lower values for surface run-off and soil loss on the planted plot than on the control.

2715. COSTIN, A. B., WIMBUSH, D. J., and KERR, D. Catchment hydrology in the Australian Alps. II. Surface run-off and soil loss. *Technical Paper, Division of Plant Industry, Melbourne* No. 14, 1960. pp. 23 + 2 photos. 53 refs.

After describing the current trends in the soils and vegetation of the Australian Alps [see *F.A.* 21 No. 1392], the authors present results of a detailed investigation of the surface run-off and soil-loss characteristics of the widespread plant-cover types that either exist naturally or have developed in association with grazing practices, based on an examination in 1956-58 of 60 plots (forest, Snow-Gum/snow-grass, and alpine herbfield areas), each plot being characterized in terms of successional status, slope, % ground cover (g.c.), amount of g.c. of different kinds (herbs and herbaceous litter, woody and sclerophyll litter, shrubs), presence or absence of trees, and soil moisture, surface compaction and soil-frost effects. The most important plot variable affecting run-off was % g.c. and, on a weight basis, herbs and herbaceous litter were more effective than woody and sclerophyll litter. Similarly % g.c. was most important in minimizing soil loss; in this respect the various cover types were equally effective, and the presence or absence of trees had no apparent effect. Slope, soil compaction, matting of g.c., frost action, and surface drying-out were also important under certain conditions. Snow-melt run-offs were low, with a tendency for higher values on depleted plots; run-off was greater on frozen ground. It is suggested that considerable improvement in catchment performance would result from management practices that encouraged succession from the widespread depleted and regrowth conditions towards more or less natural forest, Snow-Gum/snow-grass, and alpine herbfield vegetation, emphasizing the need, however, for gearing catchment management to meet the occasional stress period, e.g. heavy natural rains falling at times when the catchment is most erodible, rather than average conditions.

2716. BÁNKY, G. Talajerózió és az ellene való védekezés Heves megyében. [Soil erosion and its

control in County Heves.] *Erdő* 8 (7), 1959 (245-51 + smries. in suppl.). [Hu.russ.g.]

Half of the county, of which 90% was once forest, has a rugged topography. With population increases, 15-30% of the steeper land went to agriculture, pastures frequently lying on 30-50% slopes. Clearing led to severe erosion, against which countermeasures have been in progress locally for 70 years. These works, the erosion research station at Kisnána and the conditions necessary for success, are described.

2717. KOČERGA, F. K. Protivoerozionnye i protivoselevnye mery v Srednej Azii. [Measures to control erosion and mud and/or stone flow in [Soviet] Central Asia.] *Vestn. sel'-hoz. Nauki, Moskva* 5 (11), 1960 (91-9). [Russ.e.g.f.] O.W.

A review of measures, including proper forest management, control of livestock grazing, shelter-belt planting, orchard establishment, etc.

2718. BHIMAYA, C. P. Role of check dams in afforestation areas. *Indian For.* 86 (12), 1960 (711-8).

Deals with the author's practical experience in the course of afforesting heavily gullied areas in the Damodar Catchment.

2719. VIGNAL, M. La conservation des sols à Madagascar. [Soil conservation in Madagascar.] *Bois For. Trop.* No. 75, 1961 (17-26). [F.e.span.]

Describes a scheme of integrated arable cultivation, pasture, and afforestation, being carried out as an experiment in the Lake Alaotra valley.

2720. BETHLAHMY, N. Fertilizer helps establish grass seedlings on abandoned logging roads. *J. For.* 58 (12), 1960 (965-6).

In sowing tests on an abandoned logging road in Mount Hood National Forest, Oregon, application of 6:10:4 NPK fertilizer at 450 lb./acre and raking both significantly increased the number of grass and clover seedlings. It was considered, however, that on plots raked but not fertilized, cover might prove insufficiently thick.

14. Systematic Zoology

145.3. Crustacea

See Nos. 3766-7.

145.7. Insecta. Entomology

See also Nos. 3305 *et seq.*, 3768 *et seq.*

2721. PRASHAD, B., and SEN-SARMA, P. K. Revision of the termite genus *Nasutitermes* Banks (Isoptera: Termitidae: Nasutitermitinae) from the Indian region. *Manager of Publications, Delhi*. 1959. pp. 66. Many refs. Price 7s. 6d.

The first part of a revision of Indian genera of the subfamily, describing 20 species and subspecies, including 4 new species.

2722. EICHORN, O. Zur Embryonalentwicklung der Adelgiden (Hemipt.). [The embryonic development of the Adelgidae.] *Anz. Schädlingsk.* 34 (2), 1961 (20-6). 8 refs. [G.g.e.]

Presents a study of *Adelges nordmannianae*, *A. merkeri* and *A. prelli*, pests of *Abies alba* and *A. nordmanniana*.

2723. EICHORN, O. Zur postembryonalen Entwicklung der *Dreyfusia*-Arten (Hemipt., Adelgidae). [The post-embryonic development of *Dreyfusia* [Adelges] spp.] *Anz. Schädlingssk.* 34 (3), 1961 (39-42). 2 refs. [G.g.e.]

Presents some phenological observations and comparisons of rates of development of *Adelges prelli*, *A. merkeri* and *A. nordmannianae*.

2724. WARREN, G. L. Progress in the artificial rearing of *Hylobius warreni* Wood. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (2-3).

Studies of the life history of this insect are complicated by the prolonged duration (3-4 years) of the larval stage, and by difficulties inherent in the rearing of subcortical insects. Success has now been attained in overcoming some of these difficulties. [Cf. *F.A.* 20 No. 2733.]

2725. DYER, E. D. A. The use of marked ambrosia beetles (*Trypodendron*) in studies of spring attack flight. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (3-4).

A preliminary investigation was carried out in spring 1960 to determine whether marked beetles (*T. lineatum*) released at various distances from attractive logs, could be recovered. The low numbers of marked beetles recovered and the short distance from which they came suggest that a combination of large numbers of marked beetles, log material known to be highly attractive, and efficient recovery techniques will be necessary before a clear indication of beetle movements at this period of the year can be obtained by this method.

2726. KERRICH, G. J. The state of our knowledge of the systematics of the Hymenoptera parasitica, with particular reference to the British fauna. *Repr. from Transactions of the Society for British Entomology*, Bournemouth 14 (1), 1960 (1-18). 78 refs.

Including a discussion of the problems caused by variability, alternation of generations, behaviour differences, etc.

2727. MASON, W. R. M. A revision of the Nearctic Exenterini (Hymenoptera: Ichneumonidae). III. *Exyston* Schödt. *Canad. J. Zool.* 37 (6), 1959 (1067-115). 4 refs. O.R.S.

The genus *Exyston* (divided into the subgenera *Exyston* and *Anechphysis*) and its 20 Nearctic species are discussed. Ten new species are described, and 9 previously described species are reduced to synonymy.

2728. BRONSKILL, J. F. Embryology of *Pimpla turionellae* (L.) (Hymenoptera: Ichneumonidae). *Canad. J. Zool.* 37 (5), 1959 (655-88). 63 refs. O.R.S.

2729. SHENEFELT, R. D. *Ropalophorus* Haliday—a genus new to North America (Hymenoptera: Braconidae: Euphorinae). *Ann. Ent. Soc. Amer.* 53 (4), 1960 (542-6). Many refs. O.R.S.

Describes and illustrates *R. wisconsinensis* from 93 ♀ specimens trapped in a pulpwood storage yard at Nekoosa, Wisconsin, where *Ips pini* was abundant.

Its close relative, *R. [Eustalocerus] clavicornis*, is recorded from Europe as a parasite of *Ips typographus*.

2730. COPPEL, H. C., CASIDA, J. E., and DAUTERMAN, W. C. Evidence for a potent sex attractant in the introduced Pine sawfly, *Diprion similis* (Hymenoptera: Diprionidae). *Ann. Ent. Soc. Amer.* 53 (4), 1960 (510-2). 3 refs. O.R.S.

In field investigations virgin ♀s were found to be capable of attracting exceptionally large numbers of ♂s. One caged ♀ attracted >11,000 ♂s. The chemical properties of the attractant are under investigation. Such an attractant in a stable form, and in combination with insecticides, might prove useful in reducing populations of this arrhenotokous pest. *From authors' summary.*

2731. PRITCHARD, A. E. A new classification of the paedogenic gall midges formerly assigned to the subfamily Heteropezinae (Diptera: Cecidomyiidae). *Ann. Ent. Soc. Amer.* 53 (3), 1960 (305-16). 52 refs. O.R.S.

15. Animal Ecology. Game and Fish Management. Hunting, Shooting and Fishing

See also Nos. 3216, 3239, 3299 et seq.

2732. VAICKUTĖ, J. Lietuvos TSR pietinės dalies jaunų pušynų vorai (Araneida). [The Araneida of young Scots Pine stands in S. Lithuania.] *Liet. TSR Mokslų Akad. Darb. (Ser. C)* No. 3 (23), 1960 (133-44). 7 refs. [Lith.lith.russ.]

Brief notes on the 39 species (28 of them recorded for the first time in Lithuania) found in young Pine stands of five different density and site types. Spiders were most abundant at margins.

2733. AMMAN, G. D., and BALDWIN, P. H. A comparison of methods for censusing woodpeckers in Spruce-Fir forests of Colorado. *Ecology* 41 (4), 1960 (699-706). 9 refs.

Nine methods were used in this comparative study. The method found best, under consistent weather conditions and with a moderately large woodpecker population, was a refinement of the variable-width-strip method. The object of these studies is to facilitate a more accurate appraisal of the role of these birds (3 species) in biological control of *Dendroctonus engelmanni*.

2734. KLEIN, H. G. Ecological relationships of *Peromyscus leucopus noveboracensis* and *P. maniculatus gracilis* in Central New York [State]. *Ecol. Monogr.* 30 (4), 1960 (387-407). 52 refs.

The reasons for the ecological separation of the two species were not brought out in the study. It is improbable that differential habitat selection occurred on the basis of soil moisture, humidity near the ground, amount of ground vegetation, or presence of coniferous vs. broadleaved trees. It has, however, been shown that, during the summer months, surface soil temperatures in Sugar-Maple/Beech/Yellow-Birch woodland were 3.3-3.9°C. lower than in Chestnut/Oak woodland, and this difference may have been a significant factor in the distribution of the two species of mouse.

2735. MELICHAR, J. Zimní koncentrace jelení zvíře. [Winter concentrations of *Cervus elaphus*.] *Práce Výzkum. Úst. Lesn. ČSR* No. 20, 1960 (95-107). 6 refs. [Cz.cz.russ.g.]

Analyses distribution of winter concentrations of the *C. elaphus* population in several forest districts in Czechoslovakia: in pure Spruce (46%), mixed forest with conifers predominating (36%), pure broadleaved stands (8%), mixed forest with broadleaved species predominating (6%), and pure Scots Pine (4%); in stands of age class II (61%), I (18%), III (14%), V (5%), and IV (2%); on slopes facing N.W. (20%), S.E. (19%), S.W. (15%), S. (14%), N.E. (9%), W. (9%), plateaux and ridges (7%), E. slopes (4%), and N. slopes (3%).

16. General Botany

160. Plant Chemistry

See also Nos. 2683, 2751-2, 2756, 2758, 2847, 2859, 3227-9, 3385-6, 3599 *et seq.*, 3819 *et seq.*, 3865-6, 3875 *et seq.*

2736. ANSIAUX, J. R. La composition minérale des fruits et la voie de transport des ions alimentaires vers ceux-ci. [The mineral composition of fruits and route of transport of nutrient ions towards them.] *Annales de Physiologie Végétale de l'Université de Bruxelles* 4 (2), 1959 (53-88). 38 refs. [F.] L.S.

Presents tabulated data, derived from literature, on the distribution of K, Ca, and Mg in a large number of species, including some trees, concluding that these tend to confirm the theory of Münch (1930) and that the transport of minerals towards the fruit is, for many species, mainly through the phloem.

2737. The nutrient composition of [Oil Palm] leaves of different ages. *Extr. from Rep. W. Afr. Inst. Oil Palm Res.* 1959/60, 1960 (105-6).

An investigation was made on levels of P, K, and Mg in leaves of different ages on the same Palm. Two adult trees of the same age were selected, and every leaf was removed. On the 1st tree, every 5th leaflet on each side of each leaf was taken, and the leaflets from each leaf bulked for analysis; on the 2nd, bulk samples of every 10th leaflet from each leaf were used. The results indicate a progressive decline in K content with leaf age in both trees, though there was a considerable difference between the amounts found in leaves in the same position of the phyllotaxis in the two trees. In tree (a), Mg content increased slightly with leaf age, but not in tree (b); P content in both trees declined with increasing leaf age, but (b) had a much higher P content than (a). It is obvious that with gradients of this type, the sampling of one leaf is unlikely to give an accurate idea of nutrient status, and it appears likely that a reliable sampling procedure will involve a study of young, medium-aged, and old leaves. There is also an obvious difference between individual trees, and it will be necessary to determine the number of trees that must be sampled to obtain a good average.

2738. Effects of ashing temperature and size of sample ashed on determination of phosphorus,

potassium, magnesium and calcium [in leaves of Oil Palm]. *Extr. from Rep. W. Afr. Inst. Oil Palm Res.* 1959/60, 1960 (100-1).

Experiments were made with 1-, 5-, and 10-g. samples of leaf powder, ashed at 3 different temperatures. There was considerable variation in the amounts of K and Mg found in 1-g. samples; results with 5-g. samples were much less variable and were not significantly inferior to those with 10-g. samples. It was decided wherever possible to use 5-g. samples for estimating P, K, Mg and Ca by dry-ashing at 500° C.

2739. HAVIVI, E., and LEIBOWITZ, J. Studies on the chemical composition of pollen from *Pinus canariensis*. *Bull. Res. Coun. Israel* 9A (1/2), 1960 (157-8). 9 refs.

Results of a general analysis and of determinations of amino acids and sugars are tabulated.

2740. RONKOV, B., STAEVA, L., and PARUŠEVA, A. Izsledvanija varhu himičnija sastav na mestnija pitomen kesten (*Castanea vesca* Gärt.). [The chemical composition of *C. sativa*.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (335-49). 11 refs. [Bulg.g.]

Tabulates data on the chemical composition, particularly tannin content, of the roots, stem, and leaves of 5-year plants, and of stemwood, stumpwood, branchwood, stem bark, and branch bark of trees up to 100 years old from different parts of Bulgaria. In the 5-year trees, site affected chemical composition of the roots most and the leaves least. Stemwood composition varied most up to the age of 20, thereafter becoming relatively stable. Stem, stump, branches and roots had a high tannin content. The bark had a higher tannin content than the wood, but its high content of water-soluble non-tannin substances, reducing sugars, and ash, makes the bark less valuable as a tanstuff than the wood. Generally, tannin content of both stemwood and bark increases from the top of the tree downwards. The tannin content of the leaves and fruit cupules is also high.

2741. PRIDHAM, J. B. [Editor]. *Phenolics in plants in health and disease*. Pergamon Press, Oxford-London-New York-Paris. 1960. pp. 131. Many refs. Price 42s. O.R.E.

Proceedings of a Plant Phenolics Group Symposium, Bristol, April 1959. Sixteen papers, with discussions, in four sections: General, Lignification, Pathology, and Genetics.

2742. ARTHUR, H. R., and HUI, W. H. A new triterpene from the Hong Kong Ericaceae: an epoxy-glutinine from [leaves of] *Rhododendron westlandii*. *J. Chem. Soc.* Feb., 1961 (551-4). 14 refs. O.R.S.

2743. NEISH, A. C. Biosynthesis of pungenin from C¹⁴-labelled compounds by Colorado Spruce. *Canad. J. Bot.* 37 (5), 1959 (1085-1100). 47 refs. O.R.S.

A number of C¹⁴-labelled compounds were fed to detached leafy twigs of Colorado Spruce (*Picea pungens*), and after a metabolic period of 24 hours the pungenin [cf. *F.A.* 19 No. 72] was isolated and

the specified activities of the glucose moiety and the aglycone (3,4-dihydroxyacetophenone) were determined. In some instances the aglycone was degraded further to determine the C^{14} in the methyl and carbonyl carbons separately. Caffeic acid and L-phenylalanine were the best precursors of the aglycone; cinnamic acid, *p*-coumaric acid, phenyllactic acid and shikimic acid were quite good. Na acetate was a poor precursor, and was converted to glucose more readily than to the aglycone. Compounds found to be very poor precursors are also enumerated and chemical transformations described and discussed. One product, 3,4-dihydroxyacetophenone-carbonyl- C^{14} was fed to *P. pungens* twigs bearing new terminal growth. Up to 20% was converted to pungenin but most of it formed unidentified compounds. It proved a poor precursor of lignin, compared with cinnamic acid, and a poor precursor of glutamic acid, relative to acetate. *From author's summary.*

2744. GRISDALE, S. K., and TOWERS, G. H. N. Biosynthesis of arbutin from some phenylpropanoid compounds in *Pyrus communis*. *Nature, Lond.* 188 (4756), 1960 (1130-1). 6 refs.

The authors have found that arbutin (hydroquinone- β -D-glucoside) is synthesized in young leaves of Pear from shikimic acid, and more readily from phenylpropanoid compounds. Experiments with *Grevillea robusta* confirmed these results, but in this species the age of the leaf did not appear to be an important factor.

2745. PACHECO, H. Sur la structure d'un glucoside d'aromadendrine extrait de l'aubier de *Prunus mahaleb* et de *Prunus persica vulgaris*. [The structure of a glucoside of aromadendrin extracted from sapwood of *P. mahaleb* and *P. persica vulgaris*.] *C.R. Acad. Sci., Paris* 251 (16), 1960 (1653-4). 4 refs. [F.f.] O.R.S.

The glucoside was characterized as β -D-glucopyranosyloxy-7 trihydroxy-3,5,4'-flavanone.

2746. REZNIK, H., and EGGER, K. Myricetin—ein charakteristisches Flavonol der Hamamelidaceae und Anacardiaceae. [Myricetin, a characteristic flavonol of the Hamamelidaceae and Anacardiaceae.] *Zeitschrift für Naturforschung, Tübingen* 15B (4), 1960 (247-50). 12 refs. [G.g.] O.R.S.

The distribution of myricetin, quercetin, kaempferol, leuco-delphinidin, leuco-cyanidin, delphinidin, cyanidin and malvidin was determined for leaves of 14 species of Hamamelidaceae (*Corylopsis* spp., *Distylium racemosum*, *Fothergilla monticola*, *Hamamelis* spp., *Liquidambar styraciflua*, *Parrotia* spp., *Parrotiopsis jaquemontiana*, *Stewartia monadelphae*) and 15 of Anacardiaceae (*Schinus* spp., *Lithraea gilliesii*, *Pistacia* spp., *Rhus cotinus*, and *Rhus* spp.).

2747. CLARK-LEWIS, J. W., and MORTIMER, P. I. The 4-hydroxypipelicolic acid from *Acacia* species, and its stereoisomers. *J. Chem. Soc. Jan.*, 1961 (189-201). 38 refs. O.R.S.

The acid studied was isolated from leaves of *A. oswaldii*.

2748. SONDHEIMER, F., MEISELS, A., and KINCL, F. A. Constituents of *Casimiroa edulis* Llave et Lex. V. Identity of casimiroliol and obacunone. *J. organ. Chem.* 24 (6), 1959 (870). 7 refs. O.R.S. [Cf. F.A. 22 No. 3879.]

2749. JAFFÉ, W. G., and SEIDL, D. S. DE. Über die Hemmung von Hurain, einer pflanzlichen Protease, durch Trypsininhibitoren. [The inhibition of hurain, a plant protease, by trypsin-inhibitors.] *Experientia, Basle* 16 (11), 1960 (505). 5 refs. [G.e.] O.R.S.

Hurain, from the sap of *Hura crepitans*, is inhibited by trypsin-inhibitors.

161. Physiology

See also Nos. 2713, 2736, 2834, 2847 *et seq.*, 3002-3, 3261, 3324, 3386-7, 3429, 3562.

2750. PHARIS, R. P., and WOODS, F. W. Effects of temperature upon photosynthesis and respiration of Choctawhatchee Sand Pine. *Ecology* 41 (4), 1960 (797-9). 5 refs.

Rates of photosynthesis and of respiration in the dark were measured on seedlings of the Choctawhatchee race of *Pinus clausa*. Temperatures were varied from 18° to 48° C., while light intensity remained constant at 4000 foot-candles. The rate of apparent photosynthesis was at a maximum near 23° and became negligible at 43-48°. Respiration in the dark reached a maximum at 48°, the highest temperature used. It was shown by statistical analysis that needle fresh weight, dry weight, and length may be used with equal confidence as a basis for expressing rates of CO_2 exchange. Although the results indicate that Sand Pine seedlings may be more efficient photosynthetically than Loblolly Pine, more exact comparative work is needed in confirmation. *From authors' summary.*

2751. WEBSTER, G. C. Nitrogen metabolism in plants. Row-Peterson and Company, Evanston, Ill., and New York. 1959. pp. [4] + 152. Many refs. Price 28s.

A monograph reviewing current knowledge of the chemical pathways of cellular N metabolism in plants, in 5 sections: Nitrogen nutrition; Amino-acid metabolism; Biosynthesis of amides and peptides; Protein and nucleic-acid metabolism; and Nitrogen metabolism in the intact plant.

2752. BLAKE, G. M., HOSSFELD, R. L., and PAULEY, S. S. A technique for determining sex from vegetative buds of [sexually mature] Quaking Aspen. *For. Sci.* 6 (4), 1960 (363-4).

Samples of vegetative buds, taken from 10 each of ♂ and ♀ *Populus tremuloides* of seedling origin, were macerated separately, and chromatograms, dried and treated with Na_2CO_3 , prepared. Seen under ultraviolet light, the ♂ and ♀ are distinguished by a light green spot in the former and a brilliant orange in the latter. Deviations noted for one of each sex corresponded with chromatograms prepared from known ♂s. Further work is in progress.

2753. HASHIZUME, H. [Changes in endogenous growth substances during flower initiation and sex

differentiation in *Cryptomeria japonica*.] *Transactions of the Tottori Society of Agricultural Science*, Tottori 12, 1960 (150-4). 12 refs. [Jap.jap.e.e.] C.G.B.

2754. KAWASE, M. Locus of production of endogenous growth-substances in growing points of *Betula pubescens* as related to photoperiodic treatments. *Abstr. in Plant Physiol.* 35 (Suppl.), 1960 (xxvi). O.R.E.

Seedlings raised under 18-hr. photoperiods (*a*), were defoliated so that only one pair of newly matured leaves remained, and treated with 10-hr. photoperiods (*b*) for a week. Then the amounts of endogenous growth regulators in extracts of different parts of the stems were bio-assayed. There were no recognizable gradients in the levels of inhibitors which might suggest a translocation of inhibitors from the leaves to the growing points. In another set of experiments, some plants were defoliated as described above, and others defoliated completely. They were then given either (*a*) or (*b*) treatment and the growing points extracted and bio-assayed. The presence or absence of leaves caused a significant difference in the patterns of growth-promoting substances present in the growing points, in both (*a*) and (*b*) treatments. No differences resulting from the presence or absence of leaves were found, however, in the amounts of growth inhibitors, suggesting that the latter may be formed in the bud *in situ* and not translocated from the leaves.

2755. LEVISOHN, I. Effects of gibberellic acid, given as soil treatment, in pot-cultures of Pines. *Emp. For. Rev.* 39 (4), 1960 (483-4). 1 ref.

The following effects were noted: increase in the water-retaining capacity of the soils (two podzols and an agricultural soil); suppression of some of the natural soil vegetation, i.e. algae and mosses; and reduction in size of the Pine root systems, accompanied by marked stimulation of root-hair formation and total suppression of fungal infections. [Cf. *F.A.* 21 No. 4152.]

2756. KURAISHI, S., and OKUMURA, F. S. A new green-leaf growth-stimulating factor, phyllocococine, from coconut milk. *Nature, Lond.* 189 (4759), 1961 (148-9). 6 refs.

2757. SOKOLOV, D. V. Opyt opredeleniya élektričeskogo naprjaženija v tkanjah drevesnyh porod. [Determining the electric voltage in the tissues of woody species.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (127-9). 1 ref. [Russ.]

Reviews the work of Parr [see *F.A.* 5, p. 142], and describes similar Russian experiments on the possibility of determining the phytopathological condition of trees by the difference in the electric potential in the tissues of the stem. The species examined were Scots Pine, Norway Spruce, Siberian Larch and Fir, *Tilia rotundifolia*, *Alnus glutinosa*, *Betula verrucosa*, and Aspen. Voltage varied with species, was greatest in the evening and least in the afternoon, fell towards the end of the growing season in all species, increased with tree age, and was the same in healthy trees as in trees damaged by

heart rots. The results of long-term investigations on an Elm are still being worked out.

163. Embryology

2758. TAKAO, A. Histochemical studies on embryogenesis of *Pinus thunbergii* Parl. *Bot. Mag., Tokyo* 73 (868), 1960 (379-88). 18 refs. [E.e.jap.] I.M.I.

Discusses, on the evidence of staining, the distribution of proteins, polysaccharides, and nucleic acid in successive stages of development. Differentiation in this embryo is similar to that of *Pinus strobus* reported on by Spurr [cf. *F.A.* 12 Nos. 126, 972].

2759. HASKELL, D. A. Origin and development of the apical meristems in the embryo of *Acer saccharinum* L. *Abstr. of thesis, in Dissert. Abstr.* 21 (5), 1960 (1032-3). O.R.S.

2760. GHOSH, S. S., and SHAHI, R. A case of polyembryony in *Shorea robusta* Gaertn. *Sci. & Cult.* 23 (7), 1957 (254-6). 5 refs. L.S.

Dissection of ca. 2000 fruits showed, in the majority, single healthy embryos developing seedlings from 2-3 ovules. In 2 fruits conjoint, and in 8 fruits unattached multiple embryos (2-3) were found, developed from a single ovule—a first report of true polyembryony in this species.

2761. ROY, S. K. Embryology of *Eugenia malaccensis* Lam. *Curr. Sci.* 29 (5), 1960 (189-90). 3 refs. A.P.B.

164. Morphology

See also Nos. 2777, 2789, 2809, 2827, 2848, 2877, 3254.

2762. GHENT, A. W., and THOMAS, J. B. Regularity in distribution of supernumerary needles on the terminal growth of young Jack Pine trees. *For. Sci.* 6 (4), 1960 (331-3). 1 ref.

The % occurrence of 3-neededled fascicles in the terminal 2 in. of leaders, rest of leaders, internodes and primary laterals of *Pinus banksiana* shows a preponderance in the distal half-inch of growth (already reported for *P. resinosa* and *P. sylvestris*). It is suggested that this distribution is governed by the apical production of a growth regulator concentrated wherever shoot elongation declines. The occurrence of 3-neededled fascicles appears to dwindle at 35 years and had disappeared at 105-115 in the trees studied.

2763. COOPER, A. W. A further application of length-width values to the determination of leaf-size classes. *Ecology* 41 (4), 1960 (810-1). 5 refs.

A major obstacle to more extensive use of leaf-size classes in vegetational analysis, as originally proposed by Raunkjær, is the difficulty and tedium involved in actual measurement of leaf area. It has recently been found that, for tropical rain-forest species, leaf area could be determined with reasonable accuracy by the formula $\frac{2}{3}$ length $\times$ width [cf. *F.A.* 19 No. 2854]. Further tests have now been made on (*a*) temperate (mixed northern hardwoods in Michigan) and (*b*) arid-zone (S. Australia)

vegetation, to determine the wider applicability of this formula. A comparison of leaf size-class distributions in the whole flora (228 species) of (a), showed that use of the $\frac{3}{4}$ LW rule resulted in only 12 species being misclassified, and in (b) only one out of 46. The largest and most frequent errors were found in the classification of lobed leaves, but the use of factors of $\frac{1}{2}$ or $\frac{3}{4}$ gave reasonably accurate results for them. It is concluded that the $\frac{3}{4}$ LW rule can be used to assign most species in temperate vegetation to Raunkiaerian leaf-size classes. For lobed leaves, factors of $\frac{1}{2}$ and $\frac{3}{4}$ are recommended, the appropriate factor being determined by the size of the sinuses.

2764. GIRNIK, D. V. Redkij slučaj obrazovanija parnyh socvetij u *Tilia amurensis* Rupr. [A rare instance of paired inflorescences in *T. amurensis*.] *Bot. Ž.* 45 (5), 1960 (770). 1 ref. [Russ.]

Records, on a single specimen of *T. amurensis* near Vladivostok, the frequent appearance of two inflorescences in the axil of a leaf, with complete absence of a vegetative bud. A possible reason (excellent illumination and extra nutrients) for this phenomenon is put forward.

2765. GARAVEL, L. Une interprétation nouvelle de la morphogénèse de la coque de noix de *Juglans*. [A new explanation of the morphogenesis of the shell in *Juglans* nuts.] *Ann. Éc. Eaux For. Nancy* 17 (3), 1960 (335-75). 9 refs. [F.f.e.g.]

A study based on 8 species and several hybrids.

2766. BELOSTOKOV, G. P. Formirovanie čečeviček i ih rol' v obrazovanii probki barhata amurskogo (*Phellodendron amurense* Rupr.). [The development of lenticels, and their rôle in cork formation in *P. amurense*.] *Dokl. Akad. Nauk SSSR* 134 (5), 1960 (1244-7). 2 refs. [Russ.] A.P.B.

[Cf. *F.A.* 20 No. 1450.] Describes and illustrates exogenous and endogenous types of lenticel formation. Exogenous lenticels are formed under stomata at the beginning of summer, and endogenous ones are formed in midsummer (not under stomata) when some layers of cork cells have already appeared. Lenticels are the most active centres of cork formation in the early life of the shoots.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 2741, 2820, 2841, 2864, 2971-7, 2987-9, 3111, 3558, 3560.

2767. SNYDER, E. B. A forest-genetics literature classification based on the Oxford Decimal Classification (ODC). *Silvae Genet.* 9 (6), 1960 (167-8). 4 refs. [E.]

Discusses and criticizes Rohmeder's suggestions on the "genetics" section of the O.D.C. [cf. *F.A.* 21 No. 112], and presents a table of amendments as used domestically by the Southern Institute of Forest Genetics, Gulfport, Miss.

2768. HINKELMANN, K.; STERN, K. Kreuzungspläne zur Selektionszüchtung bei Waldbäumen. [Crossing patterns for the selective breeding of

forest trees.] *Silvae Genet.* 9 (5), 1960 (121-33). 21 refs. [G.g.e.f.]

Two different types of diallel crosses were investigated, which are designated as (I) and (II) and described in a very general manner. The corresponding complete diallels (I_s) and (II_s) may be regarded as special cases of the incomplete diallels of type (I) and (II), respectively. Both designs are described by a factorial model in such a manner that an analysis of variance of the genetic effects (additive and non-additive) and the environmental effects is possible. *From authors' summary.*

2769. COOK, S. A., and STANLEY, R. G. Tetrazolium chloride as an indicator of Pine pollen germinability. *Silvae Genet.* 9 (5), 1960 (134-6). 15 refs. [E.]

A comparison was made of Pine pollen viability determined by TTC (2,3,5-triphenyltetrazolium chloride) with that obtained by germination on agar. When the object of the determinations is to ascertain whether pollen of fairly good quality is being used, i.e. of >40-50% viability, or to select the best from two or more pollen lots, the simple TTC test is quite adequate if the pollen is fresh and the indicated viability >50%. Otherwise it is probably best to use the germination tests. In the studies, germination % was generally greater than the value obtained by staining. Estimation of viability by growing pollen is the more direct and valid method, provided that the pollen tested is representative of the actual sample from which it is taken, and optimum germination conditions are used.

2770. EHRENBERG, C. E. Studies on the longevity of stored Pine pollen (*Pinus silvestris* L. and *Pinus contorta* var. *murrayana* Engelm.). *Medd. SkogsforsknInst., Stockh.* 49 (7), 1960. pp. 31. 22 refs. [E.e.s.w.]

At room temperature, the pollen of both species had lost its viability after 1 year. At +4° and -18° C. it was unimpaired after 2 years, and thereafter deteriorated slowly, with little difference between the temperatures to the end of the sixth year, but after 7 years, Scots Pine pollen stored at +4° had a germination % of 20, against 80% for pollen stored at -18°. *P. contorta* pollen lost viability faster, and when stored at +4°, only a few grains germinated after 7 years. Here too the lower temperature was more favourable. In crossing tests with three-year-old pollen, on grafts and full-grown trees, pollen stored at -18° was still fertile, but the % of fertilized seed was less than in control tests with fresh pollen. After storage at +4°, little or no fertilization took place. The growth of pollen tubes was little affected by storage. *From author's summary.*

2771. SANTAMOUR, F. S., JR. Seasonal growth in White Pine seedlings from different provenances. *For. Res. Note Ntheast. For. Exp. Sta.* No. 105, 1960. pp. 4.

Provenance trials in progress in New Jersey represent 31 seed sources of *Pinus strobus* from 17 states of the U.S.A. and 4 Canadian provinces. Seed was sown in 1955, and during the 1959 growing

season periodic measurements of height growth were made. Variables studied were: (1) duration of growth period up to the base of the terminal bud; total growth from the tip of the 1958 terminal bud to (2) the base of the 1959 terminal, (3) the tip of the 1959 terminal or lammass shoot; and (4) the % of tip-to-base growth completed by May 18. Data for the four variables were analysed and in all cases highly significant differences were found between provenances, and also highly significant correlations with latitude and growing season of origin. Terminal growth in all provenances stopped before the longest day of the year, which suggests that the duration and cessation of growth of *Pinus strobus* is not under direct photoperiodic control. Seedlings of southern origin may be able to utilize a greater portion of the growing season in northern latitudes than those of northern origin and still remain capable of hardening off in time to escape damage by early frost.

2772. **Slash** × *Pinus caribaea* hybrid. *Extr. from Rep. Qd. For. Serv. 1959/60*, 1960 (16).

After 2 years in the field, with an average height of ca. 6 ft., this hybrid (*P. elliottii* × *P. caribaea*) has a 20% height advantage over both parents. The promise of hybrid vigour with intermediate stem form makes this cross of particular interest.

2773. PERRY, T. O. The inheritance of crooked stem form in Loblolly Pine (*Pinus taeda* L.). *J. For.* 58 (12), 1960 (943-7). 9 refs.

Studies of 2½-year-old progeny of crosses between crooked and straight trees near Gainesville, Fla., indicate that genetical factors play a major role in the development of crooked or straight trees. Crosses between straight parents yielded 4 times as many straight trees as did crosses between crooked parents. Only 3.7% of the progeny of straight parents were as crooked as the average individual from the progeny of crooked parents. Though the progenies involved in the test were too small for the determination of Mendelian ratios, the transgressive and continuous pattern of variation within all progenies strongly suggests that a number of genes are involved in the control of stem-form characteristics. Significant differences in growth rate of 10-20% were found between progenies of local origin, all of which showed 9-30% greater growth than control seedlings from the state nursery, thought to originate from seed from west central Georgia. The progenies included in the study showed no significant correlation between crooked stem form and height growth.

2774. SMITH, R. H. Resistance of Pines to the Pine reproduction weevil *Cylindrocopturus eatoni*. *J. econ. Ent.* 53 (6), 1960 (1044-8). 7 refs.

[Cf. F.A. 20 No. 3488; 21 No. 1478.] Eleven species and hybrids are classified tentatively as resistant, 19 as non-resistant. *P. jeffreyi* and *P. ponderosa* suffer serious losses in young plantations, whereas Jeffrey × Coulter and [Jeffrey × (Jeffrey × Coulter)] × *Ponderosa* are resistant. Inter- and intra-specific resistance appears to be mainly attributable to the ♀ parent, non-preference, antibiosis and tolerance all being indicated as modes of

action. A large-scale project to produce resistant Pines is in progress.

2775. EHRENBORG, C. E. Tillväxt och grenutveckling hos tallavkommor. [Increment and branch development of Pine progenies.] *Skogen* 48 (1), 1961 (6-8). [Sw.]

[Cf. F.A. 19 No. 1387.] Observations in 1957-60 on progeny of various combinations of plus and minus trees showed continued differences in forking, proleptic shoots, etc. Branch angle proved to be an inherited characteristic, relatively little affected by environment. Absolute length of branches increased with increasing plant height, but the relative length (i.e. branch length/height) showed a tendency to decrease more in plus than minus progeny. Height increment was greater in plus × plus than in minus × minus combinations but was very variable and considerably affected by environment.

2776. PARROT, L. De la variabilité génétique de la densité du bois chez l'épicéa ("*Picea excelsa*" Link.). [Genetic variation in the density of *P. abies* wood.] *Ann. Éc. Eaux For. Nancy* 17 (3), 1960 (267-334). 59 refs. [F.f.e.g. span.]

Four large groups of populations planted in 1938 were used in this study: (1) the international provenance trial near Nancy, comprising 12 provenances; (2) a progeny trial for which parents were selected in Poland; (3) and (4), two progeny trials of French origin. Increment cores were taken from at least 25 trees of each population. Variations in wood density between the 12 provenances in (1) were highly significant. No correlation was found between mean density and latitude of provenance; the correlation between density and g.b.h. was only slight and was considered to be negligible in this study. The 7 progenies of (2), derived from plus-trees selected at the same site, displayed very homogeneous density, and so, with one exception, did those in (3). It is concluded that there are genotypic differences between certain populations in respect of wood density. When selecting breeding material for pulpwood, where rapid growth and high density are both desirable, rapid growth should be the principal criterion and high density secondary, since the former varies much more widely.

2777. SANTAMOUR, F. S., JR. The relation between anatomy and inherent growth potential of hybrid Poplars. *Abstr. of thesis, in Dissert. Abstr.* 21 (4), 1960 (718). O.R.S.

A study of 25 hybrid Poplar clones, representing 18 different combinations of parents and exhibiting a wide range of growth vigour in test plantings. Characteristics determined for roots and stems of trees one year old from cuttings included: (1) bark %; (2) % of fibres in bark; (3) % vessel area in the wood; (4) vessel size; and (5) % ray tissue in the wood. The bark % of the roots appeared to be the best single criterion for early selection of vigour, significant inverse correlations being found with height, diam., and volume growth in 9-year-old test plantings at Beltsville, Md., and Williamstown, Mass. The bark % of the stem was significantly correlated with all growth variables except for volume at

Beltsville, but lack of significant differences between the clones makes this characteristic of little practical value. Highly significant differences were found between clones for all other characteristics studied, but only the % of fibres in root bark can be considered a possible selection criterion; positive, significant correlations were obtained for all growth variables except for height at Williamstown. Studies on the roots of 5 clones in replicated 6- and 10-year-old clonal tests indicate that root-bark % is a clonal characteristic. Determination of root-bark % of a small number of *Populus deltoides* seedlings and of the plants from cuttings made from them showed no significant differences between seedling and adventitious roots. Seven of the hybrid parentages were represented by 2 or 3 clones in the material studied. The consistent relation found between growth and root-bark % suggests that early selection can be made within progenies.

2778. Uputstva za praktično izvođenje selekcije topola. [Instructions for practical work in Poplar breeding.] *Topola, Beograd* 3 (12), 1959 (1004-16). [Serb.]

Gives detailed instructions, based on Italian methods, on the actual steps to be taken in Poplar breeding, with diagrams showing desirable tree characteristics and nursery lay-out.

2779. Izbor i evidencija polaznih topolovih stabala za dalju selekciju. [Choice of the first Poplar trees for further selection, and the recording of information on them.] *Topola, Beograd* 3 (12), 1959 (986-99). 7 refs. [Serb.]

Indicates the characters desirable in such Poplars and presents a detailed form for recording particulars of outstanding trees, with instructions on how to complete it. The form is a draft submitted to the sub-group for selection and breeding of the Yugoslavian National Poplar Commission.

2780. HERPKA, I. Hibridizacija i selekcija topola. [Poplar hybridization and selection.] *Rad. Istraž. Topola Jugosl. Nac. Kom. Topolu* No. 1, 1960 (43-57). 14 refs. [Serb.serb.f.]

The work described was begun in 1955 as part of the programme of the Croatian Institute of Forest and Game Research, Zagreb. Data on the origin and growth of hybrids obtained by controlled hybridization and by open pollination are tabulated, and recommendations for future research given. [Cf. *F.A.* 22 No. 158.]

2781. MARIJANOVIĆ, P. Spontani hibrid ili posebna forma domaće crne topole. [A spontaneous hybrid or special form of the native Black Poplar.] *Topola, Beograd* 3 (12), 1959 (1042-4). [Serb.]

Reports briefly on a ♀ Poplar estimated to be 7 years old, found on 12 March, 1959, in a natural stand of *Populus nigra* and distinguished readily from its neighbours by its straight stem, wide crown, and differing bark. It was completely in leaf on March 31, before any other Poplar in the region, and was just beginning to shed its leaves on Nov. 12, when all others were completely bare. It was the only tree in the stand free of *Pseudomonas syringae* infection. On March 12 it had a g.b.h. of 70 cm.

and was 11.5 m. high, vs. 90 cm. and 14 m. on Nov. 12. Attempts will be made to propagate the tree.

2782. MIŠIĆ, V. Reliktni individualni varijabilitet balkanske bukve u Garvan Klisuri (N. R. Makedonija) i kavkaske bukve u Batumu (GSSR). [Relict individual variability of *Fagus moesiaca* at Garvan Klisura (Macedonia) and of *F. orientalis* at Batumi (Georgian S.S.R.).] *Zborn. Rad. Biol. Inst. N.R. Srbije* 3 (3), 1960. pp. 31. 31 refs. [Serb.russ.e.russ.e.]

A study of the morphology and ecological significance of individual variability in two areas of relict mixed forest. [Cf. *F.A.* 19 Nos. 1416-8.]

2783. BRAY, J. R. A note on hybridization between *Quercus macrocarpa* Michx. and *Quercus bicolor* Willd. in Wisconsin. *Canad. J. Bot.* 38 (5), 1960 (701-4). 1 ref. O.R.S.

Collections of acorns were made in southern Wisconsin from trees identified by leaf and bark characters as *Q. macrocarpa*, *Q. bicolor*, and their hybrid *Q. × schuettei*. Measurements were made of (a) peduncle length, (b) cup-fringe length, (c) acorn width, and (d) acorn length; (b), (c), and (d) were found to decrease and (a) to increase from *Q. macrocarpa* through the hybrid to *Q. bicolor*. The hybrid was clearly separated from *Q. macrocarpa* in (a). A possible introgression between *Q. × schuettei* and *Q. bicolor* was noted. From author's summary.

2784. Seed-maturing period of hybrids. *Rep. Wattle Res. Inst. S. Afr.* 1959/60, 1960 (23).

Green Wattle (a) flowers in July and August and the seed ripens in 4-6 months, whereas Black Wattle (b) flowers in September and October, but the seed does not ripen until 12-14 months later. The shorter seed-ripening period of (a) is completely dominant in (a) × (b) hybrids, irrespective of the direction in which the cross is made, and it appears to be controlled by two major genes. A back-crossing programme was started in 1950, to try to incorporate the shorter seed-ripening period into (b), and has now reached the stage of the second backcross to that parent. In the second-backcross families, a number of trees have the seed-ripening period of (a), others that of (b), and a considerable number have both kinds of pod. It is concluded, from observations of a number of *Acacia* species that time of flowering and maturation period of seed are related, and that the unusual combination of late flowering and early maturation in backcrosses may result in a gene-environmental interaction causing failure of clear-cut segregation.

2785. MOFFETT, A. A., and NIXON, K. M. Induced tetraploidy in Black Wattle (*Acacia mearnsii* de Wild.). *Rep. Wattle Res. Inst. S. Afr.* 1959/60, 1960 (32-8). 3 refs.

Tetraploidy has been induced in Black Wattle by treatment of the seed with colchicine solutions. The most suitable concentration of colchicine appears to be 0.02-0.03% for 24 hours' treatment, or 0.01-0.02% for 48 hours. Tetraploids can be distinguished from diploids by measurements, at an early stage, of stomata and, later, of pollinia. The

over-all vigour of tetraploids is very much less than that of diploids and many trees lack apical dominance, resulting in much-branched crowns or, in extreme examples, large, spreading bushes. Bark thickness and tannin content in tetraploids are, on average, greater than in diploids, but because of lack of vigour, the yield of tannin per acre would almost certainly be less. Possibly if tetraploidy were induced on a wider scale and in selected trees, better basic material for selection might be obtained. *Authors' summary.*

168. Histology

See also Nos. 2758-9, 2766, 3545 *et seq.*

2786. BARDINSKAJA, M. S., and MOSKALEVA, V. E. Nekotorye dannye o strukture traheidal'nyh kletok v kallusnoj tkani *Ginkgo biloba* L. [Some data on the structure of tracheidal cells in callus tissue of *G. biloba*.] *Dokl. Akad. Nauk SSSR* 135 (1), 1960 (207-9 + 1 plate). 13 refs. [Russ.] A.P.B.

Microscopic examination of callus tissue forming on pieces of young shoots in various sterile nutrient media showed that it consisted at first of parenchymatic cells of various shapes and sizes, with distinct nuclei and living contents, and numerous starch grains. Some of these cells were considerably bigger than the others, and were rounded. Later, meristematic foci (groups of slightly elongated thin-walled cells) arose, and later still, groups of large parenchymatic cells having lignified cell-walls, with various types of secondary thickening and pitting.

2787. GHOSH, S. S., and NEGI, B. S. Anatomy of Indian Bamboos. Part 1. Epidermal features of *Bambusa arundinacea* Willd., *B. polymorpha* Munro, *B. vulgaris* Schrad., *Dendrocalamus membranaceus* Munro, *D. strictus* Nees, and *Melocanna bambusoides* Trin. *Indian For.* 86 (12), 1960 (719-27). 15 refs.

Anatomical structure of the epidermis of monocotyledons has often been of great practical value in identification. In the case of Bamboos, epidermal studies have special significance, as floral characters are not readily available, since flowering occurs only once in life. In order to assess the diagnostic value of stem epidermis, 6 important Indian Bamboo species were investigated, and the results are recorded in tables and drawings and discussed. It is concluded that epidermal anatomy is of considerable diagnostic value.

2788. SKVORCOVA, N. T. Stroenie èpidermisov u predstavitelej sem. Hamamelidaceae. [Epidermis structure in some representatives of the Hamamelidaceae.] *Bot. Ž.* 45 (5), 1960 (712-7). 12 refs. [Russ.]

Tabulates data on epidermis structure of 24 species, including *Parrotia persica*.

2789. BRAUN, H. J. Der Anschluss von Laubbaumknospen an das Holz der Tragachsen. [The connection of buds of deciduous trees with the wood of the supporting axis.] *Ber. Dtsch. Bot. Ges.* 73 (7), 1960 (258-64). 9 refs. [G.g.] O.B.D.

In sessile lateral buds the xylem strands from the

bud leaves, which are connected with the wood through lattice-like openings in the secondary tissue in the same way as those of the leaf-trace xylem elements, are eventually broken off, as a result of diameter growth. In the following year, the flushing buds often have no connexion with the xylem elements of the stem. The permanent connexion of the buds with the stem through secondary xylem only takes place when they are relatively far advanced. In the early stages of flushing, therefore, many sessile lateral buds must be provided with water via the bark. In these early stages of growth, connexion with the vascular system is secured through special medullary rays (*Knospenbasismarkstrahlen*), which are formed at the base of sessile buds in the lattice-like spaces within the secondary tissue, and which supply the growing buds with reserve substances. Stalked buds are joined to their stalk in the same way as terminal buds to the main axis, the stalk growing from the axis in the same way as a lateral branch.

2790. CUMBLE, B. G. Anatomical studies in the Leguminosae. *Trop. Woods* No. 113, 1960 (1-47 + 38 photos). 62 refs.

A study of the stem of herbaceous Papilionoideae is based on a sample of 289 species in 9 tribes. Topics discussed include new descriptive findings, comparisons between tribes and tribal relationships, comparison of secondary xylem in woody and herbaceous plants, and patterns of secondary growth and structural specialization, against the background of the question whether herbaceous dicotyledons arose from woody plants.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 3255 *et seq.*, 3755 *et seq.*

2791. BAGCHEE, K., and SINGH, U. List of common names of fungi attacking Indian forest trees, timber, and the herbaceous and shrubby undergrowths, and list of cultures of forest fungi. *Indian For. Rec. (n.s.) Mycology* 1 (10), 1954 (1960), (199-348).

Arranged under host species in alphabetical order. The list of cultures maintained at Dehra Dun is arranged in alphabetical order of fungi, with indication of hosts and localities.

2792. DEIGHTON, F. C. African fungi. I. *Mycol. Pap. Commonw. Mycol. Inst.* No. 78, 1960. pp. 43 + 2 plates. Price 12s. 6d.

Deals with miscellaneous species, chiefly from Sierra Leone. In this paper, 4 new genera of Hyphomycetes, 11 new fungus species, and 2 new combinations are proposed.

2793. ELLIS, M. B. Dematiaceous hyphomycetes: II. *Mycol. Pap. Commonw. Mycol. Inst.* No. 79, 1960. pp. 23. Price 7s.

Describes 2 *Septosporium* spp., 10 *Acrodactylus* (gen. et spp. nov.), *Balanium stygium*, *Chalara cladium* sp. nov. and *Corynespora garciniae* comb. nov.

2794. INGOLD, C. T. Submerged aquatic Hyphomycetes. *Journal of the Quekett Microscopical*

Club, London (Ser. 4) 5 (5), 1959 (115-30). 31 refs. O.R.S.

A descriptive account of these fungi, which colonize the submerged leaves of deciduous trees (but not of conifers), and are considered to be the principal cause of decay of such leaves in aerated water. [Cf. Ingold, *F.A.* 6 p. 80.]

2795. INGOLD, C. T. *Aquatic Hyphomycetes from Canada. Canad. J. Bot.* 38 (5), 1960 (803-6). 3 refs. O.R.S.

Lists 15 species of aquatic Hyphomycetes found growing on submerged decaying leaves (chiefly of *Acer* spp.) in streams in Canada. Some spore types of unknown species are illustrated.

2796. GORDON, W. L. *The taxonomy and habits of Fusarium species from tropical and temperate regions. Canad. J. Bot.* 38 (4), 1960 (643-58). 15 refs. O.R.S.

In this study, based on ca. 1200 isolates from 59 geographic areas, a total of 26 species, 4 varieties, and 17 formae, classified in 12 sections of the genus, were identified. Ca. 90% of the isolates were obtained from a total of 160 species of cultivated and non-cultivated plants. The remaining 10% come from miscellaneous habitats including wood pulp. An alphabetical list of host plants, and of other habitats, shows the *Fusarium* spp. occurring on each and the place of origin.

2797. HUGHES, S. J. *Microfungi. V. Conoplea Pers. and Exosporium Link. Canad. J. Bot.* 38 (4), 1960 (659-96 + 4 pp. of photos). 28 refs. O.R.S.

The history of the generic names *Conoplea* and *Exosporium* is traced and many of the early species names are explained from type or authenticated collections. *Conoplea*, typified by *C. sphaerica*, replaces *Streptothrix* Corda. *Streptocaulium* is probably a synonym of *Conoplea*. Six species and one variety of *Conoplea*, with synonymy and list of hosts (chiefly trees) are illustrated and described.

2798. SAKSENA, H. K., and VAARTAJA, O. *Descriptions of new species of Rhizoctonia. Repr. from Canad. J. Bot.* 38 (6), 1960 (931-43 + 1 page of photos). 13 refs.

Four new species and one variety are added to the form-genus *Rhizoctonia* from the study of 60 isolates from forest nurseries in Saskatchewan and Manitoba; these are *R. dichotoma*, *R. endophytica*, *R. endophytica* var. *flicata*, *R. globularis*, and *R. hiemalis*. They are chiefly characterized by chlamydospores in chains produced singly and in sporodochia. The chlamydospore characters were consistent within species, and are therefore considered of dependable diagnostic value. The sporodochia, however, showed considerable variability in character and size, depending largely on the substrate, and are of little use for taxonomic purposes. *From authors' summary.*

2799. REID, J., and CAIN, R. F. *Additional Diaporthales on twigs from Ontario. Repr. from Canad. J. Bot.* 38 (6), 1960 (945-50 + 1 page of photos).

The following fungi are newly reported from

Ontario: *Cryptosporella paucispora* on *Alnus* sp.; *Diaporthe taleola* on *Quercus alba*; *D. leiphaemia* var. *raveneliana* on *Q. alba* and *Quercus* sp.; *Apioporthes anomala* on *Corylus* spp.; *Valsa salicis* on *Salix* sp. The status of the family Cryptosporrellaceae *sensu* von Arx and Müller is briefly discussed.

2800. ENDE, G. VAN DEN. *Morfologie en parasitaire karakter van Septotinia podophyllina. [Morphology and parasitism of S. podophyllina.] Tijdschr. Plziekt.* 66 (5), 1960 (269-80 + 6 photos). 18 refs. [D.u.e.] E.M.B.

Isolates of *S. podophyllina*, *S. populiperda* and *S. sp.*, new strain, were examined. They did not appear to differ from each other either in morphology or in their effects on *Salix fragilis*, *Populus* spp. or *Podophyllum peltatum*. They are therefore considered to belong to one species, for which the valid name is *S. podophyllina*.

2801. SLYSH, A. R. *The genus Peniophora in New York State and adjacent regions. Tech. Publ. N.Y. St. Coll. For.* No. 83, 1960. pp. 95 + 1 plate. 40 refs. Price \$1.10.

Descriptions, drawings and keys for 91 species.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

2802. HATUSIMA, S., and AMANO, T. *Flora of Okinawa. Extension Service, University of the Ryukyus.* 1958. pp. 192. [E.Jap.]

A check list.

2803. LIU, T.-S., and CHUANG, T.-I. *New additions to the flora of Taiwan. Quart. J. Taiwan Mus.* 13 (1/2), 1960 (63-5 + 3 plates). [E.]

Ehretia lanyuensis sp. nov., *Rhododendron kawakamii* var. *flaviflorum* var. nov. and *Rhus hypoleuca*.

2804. BURTT DAVY, J., and HOYLE, A. C. [Revised by TOPHAM, P.] *Check list of the forest trees and shrubs of the Nyasaland Protectorate. Government Printer, Zomba. Rev. ed.* 1958. pp. 137. Price 15s. 6d.

Includes notes on some forest types, a catalogue of species with habit, habitat and native names, arranged alphabetically under family and genus, and scientific and native name indexes.

2805. VIERTTEL, A. T. *Trees, shrubs and vines: a pictorial guide to the ornamental woody plants of the Northeastern United States exclusive of conifers. Bull. N.Y. St. Coll. For.* No. 43, 1960. pp. 176. 69 refs. Price \$1.25.

Includes a leaf key and descriptions of 593 species.

2806. HAYES, D. W., and GARRISON, G. A. *Key to important woody plants of Eastern Oregon and Washington. Agric. Handb. U.S. Dep. Agric.* No. 148, 1960. pp. 227. Many refs.

A key based on twig or leaf characters, covering some 180 species and varieties, with notes on the forage value of the most important species.

2807. RUIZ, H., and PAVÓN, J. *Flora Peruviiana, et Chilensis, sive descriptiones et icones plantarum*

Peruvianum et Chilensium secundum systema Linnaeanum digestae, cum characteribus plurium generum evulgatorum reformatis. Tomus V (Pars II). *An. Inst. Bot. A. J. Cavanilles* 17 (1), 1959 (377–458 + 37 plates). [Latin] O.B.D.

Includes descriptions of many Peruvian and Chilean tree species, among them *Annona* spp., *Guatteria* spp. and *Bixa* spp. [with brief notes in Spanish].

174.2/.7. Gymnosperms

See also No. 3549.

2808. GOLUBEC, M. A. Dva podvida *Picea excelsa* Link i vopros ob ih arealah. [Two subspecies of *P. abies*, and their range.] *Bot. Ž.* 45 (5), 1960 (684–94). 37 refs. [Russ.e.]

Distinguishes *P. a.* subsp. *obtusquamata* and *acutesquamata*, which differ in morphology, silvicultural properties, and distribution. Subsp. *obtusquamata* is the better for plantations in the plains of W. Ukraine.

2809. VIDAKOVIĆ, M. Značenje češera, sjemenk i njihovih krilaca za sistematiku i za određivanje provenijencije crnoga bora. [The significance of cones, seeds and their wings in taxonomy and in the determination of *Pinus nigra* provenances.] *Glasn. šumske Pokuse* No. 14, 1960 (383–437). 39 refs. [Croat.croat.e.e.]

A statistical evaluation of differences in seed and seed-wing colour, seed dimensions, weight, and viability, and seed-wing and cone shape and dimensions in *P. nigra* subsp. *austriaca*, *dalmatica*, *gočensis* var. *illyrica*, and *pallasiana* in Jugoslavia.

175.2. Monocotyledons

See also No. 2787.

2810. BOR, N. L. **The grasses of Burma, Ceylon, India and Pakistan (excluding Bambuseae).** Pergamon Press, Oxford. 1960. pp. xviii + 767. 23 pp. of refs. Price £8.

Contains a brief general part on morphology, dispersal of fruits and seeds, useful and obnoxious grasses (including grasses for papermaking, soil binding, forest grasses, and grass weeds in forest plantations) preceding the main, systematic parts, divided into Panicoideae and Pooideae, and these into tribes, genera, and species in alphabetical order, and including a key to each tribe and genus, and notes on varieties, distribution, uses, etc.

2811. MURTY, Y. S., and SINGH, V. **Grasses of Hastinapur.** *Indian For.* 86 (12), 1960 (740–7). 12 refs.

[Cf. *F.A.* 17 No. 1273.] Lists of 87 species belonging to 57 genera.

2812. KOYAMA, T. **Materials toward a monograph of the genus *Smilax*.** *Quart. J. Taiwan Mus.* 13 (1/2), 1960 (1–61 + 4 plates). [E.]

176.1. Dicotyledons

See also Nos. 2781–3, 2788, 2790, 2845, 3126, 3551–4.

2813. TENNANT, J. R. **Notes on African Araliaceae: II.** *Kew Bull.* 14 (3), 1960 (400–1). Several refs.

Includes a description of *Polyscias stuhlmannii* var. *inarticulata* var. nov., and notes on the habit of *Cussonia corbisieri* and a neotype for *C. holstii*.

2814. JENTYS-SZAFEROWA, J. **Some species of Birch endemic in Poland.** [Publication], *State Council for Conservation of Nature, Warsaw* No. 7, 1960. pp. 14 + 1 + Russian smry. enclosed. 20 refs. [E.]

Distribution, biology, etc. of *Betula oycoviensis* and *B. obscura* [cf. *F.A.* 16 No. 152; 21 No. 159].

2815. VASIL'EV, V. N. Novoe o *Betula litwinowii* Doluch. [New information on *B. litwinowii*.] *Bot. Ž.* 45 (11), 1960 (1699–700). 2 refs. [Russ.]

Reports a new variety, var. *subalpina* [cf. *F.A.* 14 No. 1018], and a new species, *B. uralensis*, both from the Urals, and also the occurrence of *B. litwinowii* in the Central Russian uplands, and speculates briefly on the origin and history of *B. litwinowii*.

2816. LEONOVA, T. G. K poznaniyu roda *Euonymus* L. [The genus *Euonymus*.] *Bot. Ž.* 45 (5), 1960 (750–8). 7 refs. [Russ.]

Systematy, and the history of the development of the genus.

2817. WOOD, C. E. **The genera of Ericaceae in the southeastern United States.** *J. Arnold Arbor.* 42 (1), 1961 (10–80). 369 refs.

Contains a key to the genera and bibliographies of the family and of each genus (369 items). Of the 20 genera, *Befaria*, *Elliottii* and *Kalmia* attain tree dimensions.

2818. SHAW, H. K. A. **Notes on Malaysian Euphorbiaceae [II–XV].** *Kew Bull.* 14 (3), 1960 (353–97). Many refs.

Mostly brief notes on the taxonomy, nomenclature and distribution of representatives of the smaller, less-known genera: *Gatnaia annamica* = *Baccaurea oxycarpa*, *Sauropus micrasterias* sp. nov., *Choriceras tricolor* comb. nov. (*Dissiliaria* t.) in New Guinea, *Sumbavia macrophylla* = *Sumbaviopsis albicans*, *Chondrostylis* and *Kunstlerodendron*, *Deutzianthus*, *Ptychopyxis* (with key to spp., including 4 spp. nov.), *Botryophora geniculata*, *Cephalomappa* (with key, including 2 spp. nov.), *Koiledepas* (*Coelodepas*) (with key, including *K. stenosepalum* sp. nov.), *Oligoceras*, *Syndyophyllum excelsum* in Sumatra and Borneo, *Endospermum* spp., and *Sebastiania borneensis* in Sarawak and Brunei.

2819. SHAW, H. K. A. **Notes on Malaysian Euphorbiaceae [XVI–XIX].** *Kew Bull.* 14 (3), 1960 (469–75). Several refs.

Arachnodes becomes a new section of *Phyllanthodendron*; *Heterocalyx laotica* = *Agrostistachys*

indica; *Wetria macrophylla* is recorded from Burma; *Tapoides* gen. nov., from Borneo, is based on *T. (Ostodes) villamilii*.

2820. HADFIELD, M. Two hybrids of the Holm Oak. *Quart. J. For.* 55 (1), 1961 (53-8). 9 refs.

Describes two hybrids of *Quercus ilex*, viz. *Q. × audleyensis* and *Q. × turneri*, and comments on their histories and arboricultural features.

2821. RUDD, V. E. A new species of *Ormosia* (Leguminosae) from British Honduras and emendation of *O. schippii*. *Trop. Woods* No. 113, 1960 (124-6).

Additional collections from British Honduras indicate that two distinct taxa are included under the name *O. schippii*, the designated type of which has been matched with specimens of glabrous fruits. The other species (new) *O. velutina* has ferruginous-vellutinous fruits. Both are described.

2822. GILLET, J. B. A key to the species of *Platysepalum* Baker, with notes. *Kew Bull.* 14 (3), 1960 (464-7). 6 refs.

Essentially a modification of L. Hauman's key, extended to cover the 12 species recognized in the genus.

2823. WALKER, E. H. A revision of the Myrsinaceae of Taiwan. *Quart. J. Taiwan Mus.* 12 (3/4), 1960 (161-94 + 22 plates). 11 refs. [E.]

Describes 21 species of the genera *Maesa*, *Ardisia*, *Embelia* and *Myrsine*.

2824. GARDNER, C. A. Trees of Western Australia. No. 79—*E. foecunda*; No. 80—Fluted Horn Mallee; No. 81—Eastern Goldfields Mallee; No. 82—Oldfield's Mallee. *Bull. Dep. Agric. W. Aust.* No. 2827, 1960. pp. 7.

Notes on description and distribution of *Eucalyptus foecunda*, *E. stowardii*, *E. eremophila* and *E. oldfieldii*.

2825. FUKAREK, P. Poljski jasen i njegova morfološka varijabilnost. *Fraxinus angustifolia* Vahl (= *Fr. oxycarpa* Willd.). [Morphological variability in *F. angustifolia* (= *F. oxycarpa*).] *Glasn. šumske Pokuse* No. 14, 1960 (133-258 + 4 pp. of photos.). 270 refs. [Croat.e.e.]

The systematic position of *F. angustifolia* is reviewed from herbarium material, field collections, and an analysis of 37 different published names presumed to refer to this species. A Latin description, and key to subspecies, varieties, and forms, is given with commentary. [Cf. *F.A.* 18 No. 156.]

2826. HOWARD, R. A. Studies in the genus *Coccoloba*. X. New species and a summary of distribution in South America. XI. Notes on the species in Asia. *J. Arnold Arbor.* 42 (1), 1961 (87-95, 107-9).

(X) Of 8 species described, 4 are small trees; a distribution map is included. (XI) Lists 12 species. *Coccoloba sensu stricto* is now indigenous only in the Western Hemisphere.

2827. KOVANDA, M. Flower and fruit morphology of *Sorbus* in correlation to the taxonomy of the

genus. *Preslia* 33 (1), 1961 (1-16). 31 refs. [E.] E.M.B.

Includes keys (in Latin) to the 9 Czechoslovakian species by (a) fruits, and (b) general characters. The flowers and fruits of each species are described. *Sorbus* is retained as a *genus collectivum*.

2828. VERDCOURT, B. Notes from the East African Herbarium: XI. *Kew Bull.* 14 (3), 1960 (345-52). Several refs.

Includes, among miscellaneous notes, a description of the leaves and fruits (hitherto unknown) of *Ophrypetalum odoratum* and of *O. odoratum* subsp. *longipedicellatum* subsp. nov. and *Craterispermum longepedunculatum* sp. nov., both from Tanganyika.

2829. JOVANOVIĆ, B., and TUCOVIĆ, A. Taksonomska proučavanja jasike (*Populus tremula* L.) odnosno t. zv. Bahofenove topole na Deliblatskoj Peščari. [Taxonomic studies on Aspen (*P. tremula*) with reference to the so-called Bachofen Poplar on the Deliblato Sands.] *Rad. Istraž. Topola Jugosl. Nac. Kom. Topolu* No. 1, 1960 (5-41 + 14 tpls.). 24 refs. [Serb.serb.g.]

A review of the literature on the Bachofen Poplar shows that this name includes two forms: *P. alba* var. *nivea* f. *bachofeni* and *P. canescens* var. *bachofeni*. The Poplars growing on the Deliblato Sands, and called Bachofen Poplar, correspond to neither of these. Morphological and biometrical analysis of twigs, leaves, buds, and fruit (details given) and observations on phenology, tree form, bark, suckers, etc., show them to be forms of *P. tremula* representing adaptations of the native species to this specific environment. They belong to two forms: *P. tremula* var. *villosa delibatica* f. nov., and *P. tremula* var. *typica delibatica* f. nov. The trees are noted for their straight stems, early shedding of branches, and long, clean bole. They sucker readily, so that small stands may be found that are almost monoclonal. [Cf. *F.A.* 20 No. 3582; 22 No. 158.]

2830. DŽEKOV, S. Odomaćena piramidalna topola u NR Makedoniji *P. pannonica* Kit. syn. *P. thevestina* Dode, *P. thracia* Dode. [The fastigiate Poplar naturalized in Macedonia, *Populus pannonica* (= *P. nigra* var. *thevestina*, *P. thracia*).] *Rad. Istraž. Topola Jugosl. Nac. Kom. Topolu* No. 1, 1960 (89-126). 14 refs. [Serb.serb.g.]

Concludes that the oldest valid name for this Poplar is *P. pannonica* Kitaibel, 1821. It differs from *P. nigra* var. *italica* in sex (♀) and various other characters. Its ecology, range and climatic requirements are discussed. It reaches 40 m. in height and 60 cm. d.b.h. in the Skopje basin, but is not suitable for raising in stands in Macedonia, as it suffers heavily from *Mycosphaerella populicola* where the relative humidity exceeds 62% during the growing season. [Cf. *F.A.* 21 No. 2974.]

2831. KOBUSKI, C. E. Studies in the Theaceae. XXX. The African species of *Ternstroemia*. XXXI. A new species of *Adinandra* from the Celebes. *J. Arnold Arbor.* 42 (1), 1961 (81-6). 3 refs.

(XXX) *T. africana* and *T. polypetala*. (XXXI) *A. eymae* sp. nov.

2832. GILLET, J. B. *Clerodendrum makanjanum* and *C. wildii*. *Kew Bull.* 14 (3), 1960 (342-4). Several refs.

C. wildii (N. and S. Rhodesia, Bechuanaland and Transvaal) is maintained as distinct from *C. makanjanum* (Kenya and Tanganyika). Distinguishing characters are tabulated.

2833. MOLDENKE, H. N. Materials towards a monograph of the genus *Vitex*. VIII, IX, X and XI. *Phytologia* 6 (1-4), 1957/1958 (13-64; 70-128; 129-92; 197-231). L.S.

A taxonomic study [cf. *F.A.* 18 No. 169].

18. Plant Ecology

181. Mode of Life, Autecology.

Silvicultural Characters of Trees

See also Nos. 2914, 2933, 2968, 3435.

2834. ROUSSEL, L. Le phytotron du Patscherkofel. [The Patscherkofel phytotron.] *Rev. for. franç.* 12 (12), 1960 (769-74). [F.]

A description of the installation at 1900 m. alt. in the Tyrol above Innsbruck, primarily for anti-avalanche research, and mainly devoted to the study of young trees at or near the forest limit. It is possible to produce a variety of conditions, e.g. wind speeds up to 30 m./sec., temperatures from -40° to $+50^{\circ}$ C., various rates of precipitation etc. Young trees will be observed, growing in different climates, from the point of view of resistance to heat, cold etc., effects of evapotranspiration etc.

2835. *Agathis* spp.: caractères sylvoles et méthodes de plantation. [*Agathis* spp.: silvicultural characters and plantation techniques.] *Bois For. Trop.* No. 75, 1960 (27-32). 20 refs. [F.]

Agathis alba, *A. lanceolata* and *A. moorei*.

2836. ČOLIĆ, D. B. Neki pionirski karakteri Pančičeve omorike i njena uloga u sukcesiji biljnih zajednica. [Some pioneer characters in the Serbian Spruce (*Picea omorika*) and its role in the succession of plant communities.] *Arhiv Bioloških Nauka, Srpsko Biološko Društvo, Beograd* 9 (1/4), 1957 (51-60). [Serb.russ.e.] From *abstr.* in *Biol. Abstr.* 35 (20), 1960 (No. 54913).

Discusses the ecology of *P. omorika* and suggests its use outside its natural range for the afforestation of extreme sites.

2837. SNOW, A. G., JR. Silvical characteristics of Virginia Pine (*Pinus virginiana*). *Sta. Pap. Ntheast. For. Exp. Sta.* No. 131, 1960. pp. 22. 78 refs.

2838. HOUGH, A. F. Silvical characteristics of Eastern Hemlock (*Tsuga canadensis*). *Sta. Pap. Ntheast. For. Exp. Sta.* No. 132, 1960. pp. 23. 90 refs.

2839. GILBERT, A. M. Silvical characteristics of Yellow Birch (*Betula alleghaniensis*). *Sta. Pap. Ntheast. For. Exp. Sta.* No. 134, 1960. pp. 18. 30 refs.

2840. LOTTI, T. Silvical characteristics of Shumard Oak (*Quercus shumardii* Buckl.). *Sta. Pap. Stheast. For. Exp. Sta.* No. 113, 1960. pp. 10. 13 refs.

181.1. Distribution, Natural Range

2841. DYLLIS, N. V. O genetiko-selekcionnom i botaniko-geografičeskom značenii kontakta arealov listvennic sibirskoj i daurskoj. [The genetical, breeding and plant-geographical importance of contact between the areas of *Larix sibirica* and *L. gmelinii*.] *Soobšč. Inst. Les.* No. 11, 1959 (3-13). 15 refs. [Russ.]

From examination of herbarium material and from studies in the area of overlap of the ranges of the two species in the upper Lena and the Trans-Baikal regions, it is concluded that hybrids are found in a belt much wider than that of the overlap of the pure parent species. Examination of fossil finds and the present populations indicates that the eastern boundary of the area of *L. sibirica* has been retreating throughout the Pleistocene up to the present day, while the western boundary of the area of *L. gmelinii* has been correspondingly advancing.

2842. TOŠIĆ, M. Još neki podaci o rasprostranjenju munike (*Pinus heldreichii* Christ.) u Srbiji. [Further data on the distribution of *P. heldreichii* in Serbia.] *Šumarstvo* 13 (7/8), 1960 (383-8). 16 refs. [Serb.f.]

Describes 4 further sites for *P. heldreichii* between Mt. Ozren and the River Lim, including one on serpentine. It was previously thought that it grew exclusively on calcareous soils. [Cf. *F.A.* 22 No. 222.]

2843. MALYŠEV, L. I. Ošibočnoe mnenie o proizrastanii kedrovogo stlanika (*Pinus pumila* [Pall.] Rgl.) v Sajanah. [A wrong opinion on the occurrence of *P. pumila* in the Sayan Mts.] *Bot. Ž.* 45 (5), 1960 (737-9). 13 refs. [Russ.]

Disputes the opinion generally held since 1873 that *P. pumila* occurs in the E. Sayan Mts., and seeks to prove that *P. sibirica* has been mistaken for it there, and that therefore the W. limit of the range of *P. pumila* is in the Khamar-Daban Mts., S. of Lake Baikal.

2844. PARDOS, J. A. Los tejos. Estos árboles anacrónicos tienen un interesante reducto en la provincia de Gerona. [Yews. These 'relict' trees maintain an interesting stronghold in the province of Gerona.] *Montes, Madrid* 16 (96), 1960 (581-8) [Span.]

Although Yew is in process of disappearing from the Spanish forests, a thriving natural stand has been found in the forest of Misaclos in the province of Gerona. Data are presented on the past and present distribution of Yew, its ecological requirements, and the site, climate and other vegetation of the stand in Misaclos forest. The evidence suggests that this is a stand of fairly recent origin, arising from water-borne or bird-transported seed.

2845. BRAUN, E. L. The genus *Tilia* in Ohio. *Ohio J. Sci.* 60 (5), 1960 (257-61). 5 refs. C.G.B. Ohio populations of *Tilia* consist of 3 basic species

—*T. americana*, *T. heterophylla* and *T. floridana*, and also a species complex referred to as *T. neglecta*. The pre-history and history of the genus are briefly reviewed and the present distribution of the species in Ohio is discussed and illustrated by maps.

2846. CHUDNOFF, M., and KARSCHON, R. *Ulmus canescens* Melville in Israel. *La-Yaaran* 10 (1/4), 1960 (16–18, 56–54). 6 refs. [Heb.e.]

This widely distributed new species of Eastern Mediterranean Elm reaches the Yarkon River (lat. 32° 06') the southernmost point of its range. The present stations in Israel constitute a small disjunct relict of an ancient boreal element. Its fast growth and valuable timber recommend planting (along perennial watercourses).

181.2. Atmospheric Relations. Acclimatization

See also Nos. 2670, 2750, 2754, 2865, 2878, 2956 *et seq.*, 3069, 3101–3, 3105, 3220–4, 3471.

2847. GOOR, C. P. VAN. De invloed van de zonnestraling op de groei van de douglas. [The effect of insolation on the growth of Douglas Fir.] *Landbouwkundig Tijdschrift, Wageningen* 70 (9), 1958 (693–5). 4 refs. [Du.] A.P.B.

Discusses the reduction in growth and the discoloration and lower N content of needles of trees growing on unsheltered areas as compared with those having belts of older trees lying to the S., S.E. or S.W. of them; results confirm that in the Netherlands the species needs protection from the winter sun [cf. *F.A.* 19 No. 4163].

2848. HANSEN, H. C. Lysets indflydelse på dannelsen av lys- og skyggeblade. [The influence of light on the formation of sun- and shade-leaves.] *Dansk Skovforen. Tidsskr.* 46 (1), 1961 (19–25). 2 refs. [Dan.]

Studies in which Beech branches were cut before flushing, and allowed to develop in different degrees of shading or exposure to full light, showed that leaf thickness is determined by the degree of light to which the shoots were exposed in the previous summer, those from sun-shoots being thicker, but that the tissue structure is determined by the light at the time of flushing, palisade cells being long and closely packed in leaves flushing in full light and short and more widely spaced in those flushing in shade, irrespective of whether the leaves had developed from sun- or shade-buds.

2849. TAGEEVA, S. V., BRANDT, A. B., and DEREVIANKO, V. G. Izmeneniya opticheskikh svoystv list'ev v techenie vegetatsii. [Changes in the optical properties of leaves during the growing season.] *Dokl. Akad. Nauk SSSR* 135 (5), 1960 (1270–3). 8 refs. [Russ.] A.P.B.

Graphs the seasonal changes in light absorption, for wavelengths 433, 545 and 656 $m\mu$, by leaves of *Betula verrucosa* (light-demander) and *Tilia cordata* (shade-bearer) from 13 May to 1 Oct. The curves are generally similar for the two species, but *T. cordata* leaves are morphologically adapted to use radiant energy more efficiently. Saturating the

leaves with water had little effect on light absorption by the xeromorphic leaves of *B. verrucosa*, but considerably reduced absorption by leaves of *T. cordata*, with their more open mesophyll. It is concluded that the intercellular spaces of the mesophyll are important, not only as air reservoirs, but also in reflecting light (and so favouring its absorption and use), within the leaf.

2850. PARKER, J. Seasonal changes in cold resistance of some northeastern woody evergreens. *J. For.* 59 (2), 1961 (108–11). 18 refs.

Tests with a temperature-controlled apparatus on cooling and warming twigs with their attached leaves cut throughout the year were made in Connecticut on (a) *Tsuga canadensis*, (b) *Pinus strobus*, and (c) *Kalmia latifolia*. Characteristic rates of hardening in autumn were noted; (b) hardened most rapidly, (c) next, and (a) slowest. In summer, the hardiness of all species failed at ca. -8°C . Young leaves of all species were resistant to at least -80° in midwinter, using slow rates of cooling and warming. A single sample of (b) was cooled to -189° in March without apparent damage. In spring, (a) began to dehardened first, though all species dehardened rapidly when warm weather came. Shade-grown (c) did not develop the winter hardiness of open-grown plants, and had a lower sugar content. Two-year-old (a) leaves were much less resistant to cold than the youngest leaves in midwinter, but were harder in summer. The rate of cooling and warming in the apparatus was important, because it affected the level of resistance measured. Killing of (c) and branches of (a) and (b) in the field, and of seedlings in nurseries, occurred in the winter of testing. This was believed to be the result of winter drying brought on by frozen soil and frozen xylary water, plus some transpiration. The role of temperature in determining northern limits of forest trees is discussed. Although winter drying appears to be a more serious cause of damage than direct cold, the latter can be serious with exotics and on rare occasions native plants also. [Cf. *F.A.* 22 No. 230.] *From author's summary.*

2851. SAKAI, A. Effect of polyhydric alcohols to [sic] frost hardiness in plants. *Nature, Lond.* 189 (4762), 1961 (416–7). 5 refs.

[Cf. *F.A.* 21 Nos. 2836–7.] Tabulated data are given of the content in winter of various alcohols and sugars in twig bark or leaf of a number of woody species including *Betula tauschii*, *Populus nigra* var. *italica*, *Larix leptolepis*, *Taxus cuspidata*, *Pinus pentaphylla*, *Abies mayriana*, *Platanus orientalis*, *Picea glehnii* and several shrubs. It is concluded that polyhydric alcohols play little part in the increase of frost hardiness in most woody species.

2852. PERRY, T. O., and WANG, C.-W. Genetic variation in the winter chilling requirements for date of dormancy break for *Acer rubrum*. *Ecology* 41 (4), 1960 (790–4). 19 refs.

A fuller account, with research data, of a study already briefly reported [cf. *F.A.* 19 No. 1468].

181.3. Water, Soil and Root Relations

See also No. 3471.

2853. APPLEQUIST, M. B. **Soil studies on Southern hardwoods.** *Proc. 8th For. Symp. La. Sch. For.* 1959 (49-63). 13 refs.

A study of Black Swampgum (*Nyssa sylvatica* var. *biflora*) and Tupelo (*N. aquatica*) based on 90 sample plots in S.E. Georgian swamps, mostly in stands with *N. aquatica* predominating. No clear relationships of site index with site types based on drainage or with any of the 9 soil variables tested were found, but there seemed to be a trend for clay content of the least permeable soil layer to be positively related to height growth, suggesting that even on these sites abundance of water favoured growth [cf. *F.A.* 10 No. 1808]. Diameter increment for *N. sylvatica* was best on pond sites. It was generally less than that of *N. aquatica*. Site index curves, mean bd.-ft. volumes by age and site index, and data on stand structure and volume increment are given. A method of obtaining very thin longitudinal sections of increment cores for microscopic examination is described.

2854. JARO, Z. A nyárak termőhelyi igénye. [The site demands of Poplars.] *Erdő* 9 (1), 1960 (32-40 + smries. in suppl.). [Hu.russ.g.]

Since the climate of Hungary is generally suitable, the author considers the demands of different species of Poplar on the physical, chemical and hydrological properties of the soil. Limiting values of single factors are not critical. Recommendations for the heavier soils, classified by type and thickness of the fertile layer, are tabulated.

181.31. Water Relations

See Nos. 3068-9, 3222-3, 3280, 3429.

181.32/34. Soil and Nutrient Relations

See also Nos. 2686-90, 2698, 2700-2, 2865, 2871, 3079-81, 3225, 3558.

2855. SWAN, H. S. D. **The mineral nutrition of Canadian pulpwood species. Phase II. Fertilizer pellet field trials.** Progress report No. 2. *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 122, 1961. pp. 6.

[Cf. *F.A.* 21 No. 4139.] The 1960 growth and survival data for 26 trials indicate that the over-all mean increase in leader length attributable to pelleting was only 10-36%, but in 7 of the trials the increase was >20%. Bottom pelleting depressed leader length in 8 trials, but in only 4 cases was the depression >5%. Side pelleting was slightly better than bottom pelleting. Pelleting did not appear to have any significant effect on survival. At the next remeasurement, nutritional status will be compared on the basis of foliage samples.

2856. **The periodic uptake of nitrogen, phosphorus, and potassium by White Spruce seedlings.** *Extr. from Rep. For. Res. Glendon Hall Fac. For. Univ. Toronto* 1959/60, 1960 (3).

During the 1959 growing season, samples of *Picea glauca* seedlings in their second year were taken at fortnightly intervals. During this growing

season, the relation of growth against time was linear; N uptake paralleled the growth curve; K uptake also followed the growth curve until mid-summer, when there were losses from the plants. P differed from N and K in that the uptake rate, instead of following the growth curve, was very low in late July and early August, but rose to a second maximum (the first was in the spring) in early September.

2857. KRAUSE, H. H., and WILDE, S. A. **Uptake of potassium by Red Pine seedlings and losses through leaching from fertilizers of various solubility.** *Proc. Soil Sci. Soc. Amer.* 24 (6), 1960 (513-5). 6 refs.

The uptake of K by Red Pine seedlings, and the losses through leaching from irrigated, coarse-textured soil treated with fertilizers of different solubility were determined by plant tissue analyses and the use of tension lysimeters. KCl, K₂Ca metaphosphate and 20-mesh syenitic granite were used as sources of K. Considerable fractions of K were lost from applications of readily soluble KCl. The metaphosphate possessed a greater stability and fertilizing value than KCl. The pattern of K leaching followed the rate of nitrification in the soil. The fraction of available K of the applied granite became exhausted during the second growing season. *From authors' summary.*

2858. [N-P interaction.] *Extr. from Rep. Qd. For. Serv.* 1959/60, 1960 (20-1).

Greenhouse investigations on the nutrition of *Pinus taeda*, *P. caribaea*, *Araucaria cunninghamii* and *Agathis australis* were continued. The N/P interaction observed in pot experiments [see *F.A.* 21 No. 3140] has now been shown clearly in a number of field experiments designed to test the effect of cultivation, (NH₄)₂SO₄, NaH₂PO₄ and other fertilizers. Analysis of first-year increments showed the effect of cultivation and of cultivation/P interaction to be highly significant; P in the absence of cultivation gave no response. There is evidence that the effect of cultivation is due primarily to promotion of mineralization of soil N. In other experiments in fertilizing *P. taeda* with superphosphate and urea, a significant N/P interaction was found, but little or no response to either fertilizer when applied alone.

2859. CANNON, T. F., CHADWICK, L. C., and REISCH, K. W. **Nitrogen and potassium nutritional studies of *Gleditsia triacanthos inermis* 'Moraine'.** *Proc. Amer. Soc. Hort. Sci.* 75, 1960 (693-9). 9 refs. E.M.B.

Plants of *Gleditsia triacanthos inermis* 'Moraine' were supplied in two consecutive years with nutrient solutions containing 5 different levels of N (5, 20, 40, 80 or 160 p.p.m.) and 2 different levels of K (30 or 60 p.p.m. in 1956 and 30 or 120 p.p.m. in 1957). P (5 p.p.m.), Ca (200 p.p.m.), Mg (25 p.p.m.) and Fe (5 p.p.m.) were constant for all treatments. Leaves were collected and analysed, and growth measurements made in August 1956 and June 1957. In general, as substrate N increased, total leaf content of N and Ca increased and P, K, Mg and Fe decreased. As substrate K increased, leaf K and Mg decreased. The relationship of K

to the other elements was not so clear. In the conditions of the experiment, based on growth measurements alone, the most desirable levels of substrate N and K were 80 and 30 p.p.m. respectively. *From authors' summary.*

2860. TRUŠKOVSKI, A. A. K voprosu o solestojčivosti tamariksa mnogovetvistogo (*Tamarix ramosissima* Ldb.). [On the salt resistance of *T. ramosissima*.] *Soobšč. Inst. Les.* No. 11, 1959 (14-26). 33 refs. [Russ.]

In the Tugai-Khuduk area of the Astrakhan sands, mass mortality due to mineralization of ground-water and soil salinity has been observed in recent years in *T. ramosissima* planted in 1911-13. The results of physical and chemical soil analyses are presented and discussed. It was found that *T. ramosissima* can grow, though depressed, at mean concentrations of 5-8 g. Cl/litre in the solution of the rooting zone and at a maximum concentration of 8-5 g./litre in the lower levels of the zone. Cl concentrations greater than these are toxic to the plant.

2861. POHITON, P. P. Rol' kornej kustarnikovoje rastitel'nosti v obogaščenii počvy organičeskim veščestvom i azotom. [The role of shrub roots in enriching the soil with organic matter and N.] *Počvoved.* 1960 (12), (57-63). 22 refs. [Russ.russ.e.] A.P.B.

[Cf. F.A. 21 No. 1330; 22 No. 257.] Tabulates data on the effect of 13 forest shrub species found in the Ukraine on the contents of humus, water-soluble organic matter, and N in various soils. Shrubs appreciably increased these contents, an effect ascribed largely to matter contributed by dead root-hairs and small roots and by micro-organisms of the root zone. It is possible that stand yield might be increased by suitable choice of shrubs or by regulating the composition of existing underwood.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

2862. TRAPPE, J. M. Some probable mycorrhizal associations in the Pacific Northwest. II. *Repr. from Northw. Sci.* 34 (4), 1960 (113-7). 13 refs.

Lists further probable examples [cf. F.A. 19 No. 2811] from field observations covering 23 fungi (*Amanita*, *Boletus*, *Cantharellus*, *Cortinarius*, *Gomphidius*, *Hebeloma*, *Hygrophorus*, *Lactarius*, *Leccinum*, *Rhizopogon*, *Suillus*, and *Xerocomus* spp.) associated with one or more of: *Pseudotsuga taxifolia*, *P. taxifolia* var. *glauca*, *Tsuga heterophylla*, *T. mertensiana*, *Cedrus deodara*, *Abies amabilis*, *Pinus contorta*, *P. ponderosa*, *P. monticola*, *Sorbus americana*, *Salix scouleriana* and *Populus tremuloides*.

2863. BOULLARD, B. Importance des mycorrhizes pour la régénération de l'épicéa (*Picea excelsa* Link) (suite). [The importance of mycorrhizae for the regeneration of Norway Spruce. Continuation.] *Bull. Soc. For. Franche-Comté* 31 (5), 1961 (245-54). 3 refs. [F.]

Reports some further experiments confirming the author's previous findings [cf. F.A. 21 No. 2851].

2864. LINNEMAN, G. Differences in strains [races] of *Pseudotsuga taxifolia* as regards mycorrhizae. New Zealand Forest Service, Wellington. [1960.] pp. 13 + 8 photos. Transl. from *Allg. Forst- u. Jagdztg.* 131 (2), 1960 (41-7). [See F.A. 21 No. 2856.] Limited distribution.

2865. HACSAYLO, E., and SNOW, A. G., JR. Relation of soil nutrients and light to prevalence of mycorrhizae on Pine seedlings. *Sta. Pap. Ntheast. For. Exp. Sta.* No. 125, 1959. pp. 13. 10 refs.

In replicated trials at Beltsville Experimental Forest, seedlings of *Pinus virginiana*, *P. taeda*, and *P. strobus* were grown outdoors in clay pots set in sand. Plots were exposed to natural daylight (a) without shade, (b) with shade, and (c) plus light from incandescent bulbs during part of the dark period. Four levels of soil nutrition were provided (N₁-N₄). Examination after 5 months showed that root systems of seedlings grown at the N₁ nutrient level were consistently smaller than those grown at higher levels. Mycorrhiza formation was heaviest at the N₂ and then the N₁ level, decreasing at N₃ and seldom evident at N₄. The mycorrhizae were simple, dichotomously branched or coralloid in form, and the fungus mantles white, grey, or black (the last probably *Cenococcum graniforme*). Mycorrhizae developed best on plants under (a), particularly at the low nutrient levels. Under (b), the formation of mycorrhizae was much less, and under (c) varied according to species. Certain trends of mycorrhizal prevalence were noted. Under (a), *P. virginiana* formed fewest mycorrhizae; under (c) *P. taeda* formed most, and *P. strobus* fewest.

2866. ŠEMAHANOVA, N. M. Uslovija obrazovaniya mikorizy sosny s *Boletus luteus* (Linn.) Fr. v čistoj kul'ture. [Conditions for the formation of mycorrhizae by *B. luteus* on *Pinus sylvestris* in pure culture.] *Izv. Akad. Nauk SSSR (Ser. biol.)* 1960 (2), (240-55). 15 refs. [Russ.russ.e.] A.P.B.

[Cf. F.A. 21 No. 2721.] An investigation of the effect on mycorrhiza formation of amounts and ratios of N, P and glucose, light intensity, pH, amount of nutrient medium, mineral or organic N compounds, and age of seedlings and of pure cultures of *B. luteus*. Vermiculite was used as the substrate, and the nutrient solution was Melin's [cf. F.A. 12 No. 59] with the addition of vitamin B₁. Mycorrhiza formation was best when amounts of N and P were relatively small, with N/P ratios of 1/1.6 or 1/3, and at pH 5.4. Organic N compounds were not as favourable as mineral N for mycorrhiza formation. The pure-culture inoculum should be 2-4, and the seedlings 2 weeks old. Greatest diversity in form of the mycorrhizae and greatest mycelial development occurred with the greatest amounts of glucose.

2867. BENCZE, L., and KISS, L. A mykorrhiza-oltásban rejlő lehetőségek. [The possibilities of mycorrhizal inoculation.] *Erdő* 9 (7), 1960 (241-6 + smries. in suppl.). 6 refs. [Hu.russ.g.]

The authors report the results of experiments on Poplars initiated by the late R. Bogor, responsible for a wide range of research in this field. Inoculations with cultures of *Cortinarius collinitus* or *Lactarius*

quietus resulted in a growth increase of 270%; with *Amanita pantherina* 320 and 460%; with Complex "B" plus *L. quietus* and *Boletus scaber*, 780%. Complex "B" consists of *B. edulis*, *B. luridus*, *B. granulatus*, *Russula cyanoxantha*, *R. fragilis*, *A. vaginata*, and *Hebeloma crustuliniforme*. The presence of less evidently mycotrophic fungi also has a marked effect.

2868. MANNINGER, E., and Soós, T. *Rhizobium*-baktériumok hatása az akác növekedésére. [The influence of *Rhizobium* bacteria on the growth of *Robinia*.] *Erdő* 9 (6), 1960 (238-40 + smries. in suppl.). [Hu.russ.g.]

Seedlings treated with inoculum from *Robinia* nodules of various provenance showed much increased growth. A simple application at sowing is effective and will reduce the demand on soil nutrients. The state inoculation institute "Phylaxia" holds supplies.

2869. MORRISON, T. M., and HARRIS, G. P. Root nodules in non-leguminous plants in New Zealand. *Proc. N.Z. Ecol. Soc.* No. 6, 1958 (23-4). 10 refs.

Reviews the literature and lists the non-leguminous genera in which root nodules occur, and discusses possible N fixation by *Coriaria* spp. and *Discaria toumatou* [cf. *F.A.* 20 Nos. 2925-7].

181.36. Root Relations and Root Development etc.

See also Nos. 2777, 2874, 3079, 3098.

2870. ZUDIN, N. A. Počvennyj bur dlja izučeniya kornevyh sistem drevesnyh rastenij. [A soil borer for studying the root systems of woody plants.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (154-5). [Russ.]

The probe (volume 1000 c.c.) is briefly described, and its use in studying the root system of a 36-year Pine/Birch stand outlined.

2871. Effect of substrate depth on the growth of seedlings of *Picea mariana*, *Pinus banksiana*, *Larix laricina*, and *Betula lutea*. *Extr. from Rep. For. Res. Glendon Hall Fac. For. Univ. Toronto 1959/60*, 1960 (7).

Seedlings were grown in tubes (2.5 × 2.5 cm. inside) with depths of ca. 9, 18, and 27 cm., in a mixture of perlite and shredded sphagnum to which a nutrient solution was added twice weekly. For the first 5 months, the depth of the medium made little difference to the weight of the plants, though the entire depth of the medium was exploited by the root system. After 6 months, the seedlings in the shorter tubes were smaller. The advantages of a deeper medium seem to be related to water supply rather than to nutrient supply or to any inherent need of the tree to have deep roots.

2872. STEUBING, L. Wurzeluntersuchungen an Feldschuthecken. [Root studies in field hedges.] *Zeitschrift für Acker- und Pflanzenbau, Berlin* 110 (3), 1960 (332-41). [G.g.e.] P.O.

Studies were made on hedges 4-6 m. wide, containing a variety of deciduous trees and shrubs, by digging trenches to expose the roots. *Fraxinus excelsior*, *Sambucus nigra* and *Populus alba* showed

extensive root systems, penetrating to the deeper soil layers, and *Corylus avellana*, *Euonymus europaeus* and *Ligustrum vulgare* intensive root systems, confined mainly to the surface layers. Penetration into neighbouring fields was markedly less with a ditch between the hedge and the field, the accumulation of leaf mould in these conditions encouraging concentration of tree roots in the ditch itself. Crop growth was depressed less by trees with intensive than extensive root systems.

2873. SEN, D. N. Self-saprophytism in roots of *Tilia cordata* L. *Preslia* 33 (1), 1961 (36-40 + 2 plates). 6 refs. [E.e.cz.] E.M.B.

Describes instances where dead, internally decayed roots which had died in an unfavourable sandy subsoil layer, were penetrated by young roots of the same tree. Growing inside the old roots, the young ones enjoyed better ecological conditions than outside.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 3058, 3239-41.

2874. WOODS, F. W. Biological antagonisms due to phytotoxic root exudates. *Bot. Rev.* 26 (4), 1960 (546-69). 217 refs.

A review of selected world literature under the main heads: general; methods of study; excreted substances; exudates of woody plants; exudates of grasses and herbs; interactions of higher plants and microorganisms; and ecological considerations.

2875. McNAMARA, E. F., and REIGNER, I. C. Effect of competition on height growth and survival of planted Japanese Larch. *For. Res. Note Ntheast. For. Exp. Sta.* No. 103, 1960. pp. 4. 1 ref.

In trials on scrub Oak areas in Pennsylvania, growth and survival both increased with intensity of soil preparation (working 1, 2, or 3 times with a roto-tiller), but were in no case good, and this species is clearly not suited to compete with hardwoods.

181.5. Reproductive Behaviour

See also Nos. 2752-3, 2784, 2871, 2975, 2980 *et seq.*, 3311.

2876. MENNINGER, E. A. Flowering trees that fail to flower in alien lands. *Indian Horticulture, New Delhi* 4 (3), 1960 (24-6).

The author, who has made a collection of ca. 1000 species of tropical flowering trees and shrubs in S. Florida, where temperatures never fall below freezing, notes some species that will not flower there, though they grow vigorously, e.g. *Jacaranda mimosaeifolia*, *Phyllocarpus septentrionalis*, *Metrosideros tomentosa*, *Triplaris americana*, *Millettia* spp. and *Stenocarpus sinuatus*.

2877. CAMERON, M. A. The flowering and fruiting of Hoop Pine [*Araucaria cunninghamii*]. *Queensland Naturalist, Brisbane* 16 (1/2), 1958 (23-6). L.S.

A description of the buds, inflorescences, cones and seed, position of ♂ and ♀ inflorescences on the

tree, pollen shedding, cone ripening, seed dispersal, germination, etc. After a very heavy seed-year, seeds per acre varied from 4 to >17 millions, and stockings of 320,000 seedlings/acre were not uncommon. Most seedlings, however, get destroyed by browsing wallabies and spring droughts.

2878. OLSON, J. S., STEARNS, F. W., and NIEN-STAEDT, H. Eastern Hemlock [*Tsuga canadensis*] growth cycle and early years. *Circ. Conn. Agric. Exp. Sta.* No. 205, 1959. pp. 24. 6 refs.

A simplified and popular account of the findings of studies already fully reported [see *F.A.* 21 No. 266].

2879. CHING, T. M. Seed production from individual cones of Grand Fir (*Abies grandis* Lindl.). *J. For.* 58 (12), 1960 (959-61). 10 refs.

Twenty *A. grandis* cones collected from a natural stand in Oregon on 15 Sept., 1958, were dried individually, and their seeds separated manually and germinated after 4 weeks' stratification. Cone length, fresh and dry weight, moisture content and seed production were found to be variable. Seed yield was significantly correlated with cone dry weight and length. The germinability of the seed was affected to a large extent by cone maturity. *From author's summary.*

2880. DOLGOŠOV, V. I. Plodonošenie ostrolistnogo klena. [Fruiting of *Acer platanoides*.] *Priroda, Moskva* 49 (11), 1960 (126-7). [Russ.] A.P.B.

Maps the range of the species in the Russian plain, and the frequency of years of good and abundant fruiting.

2881. LJUBČENKO, V. M. Prorastanie zarodyšej lipy melkolistnoj i bereskleta evropejskogo v zavisimosti ot stepeni zrelosti semjan. [The growth of embryos of *Tilia cordata* and *Euonymus europaeus* in relation to the ripeness of the seeds.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (58-62). 3 refs. [Russ.russ.]

[Cf. *F.A.* 21 Nos. 4302-3.] The ability of the embryos to grow increases with ripeness in both species, but in *E. europaeus* only very slightly.

2882. MCREYNOLDS, R. D. Mortality of newly germinated Southern Pine seedlings following inundation. *Tree Plant. Notes* No. 43, 1960 (23-5).

A study was made at the Southern Forest Experiment Station, Oxford, Miss., to test the ability of newly germinated seedlings of (a) *Pinus taeda*, (b) *P. palustris*, (c) *P. echinata* and (d) *P. elliotii* to withstand submergence lasting up to 20 days. Results indicate that: (1) at 15 or 20 days old, (a) and (c) have developed some resistance to flooding; most 25-day-old (a) can survive 20 days of flooding, but (c) die off after 12 days. (2) Seedlings of (b), 25 days old, are damaged by flooding for any length of time and killed if flooded >12 days. (3) At 25 days old, (d) begin to survive 10 days' flooding and up to 60% can survive 20 days. (4) Summer flooding is more injurious than spring flooding.

2883. BROWN, R. T., WOERPEL, L. S., and WOOD, R. D. Influence of substratum on the germination of

Betula alleghaniensis and possible successional significance. *Abstr. in Bull. Ecol. Soc. Amer.* 41 (3), 1960 (87). A.P.B.

The A and B horizons of various soils, and rotten wood, were used as germination media for Yellow Birch, with sterile sand as a control. All soils containing organic matter were pulverized. Germination ranged from 16.2% on an alluvial mucky soil to 27.5% on the control. Rotten Hemlock wood produced 25.3% germination, the highest of the media used except for the control. Preliminary experiments with other seeds showed an even higher selectivity. A possible explanation of this would be that germination inhibitors are present in the substratum. If such behaviour is common in germination, it could be a significant factor in plant succession.

2884. KALINKOV, V. Dinamika na pokalnavaneto i ponikvaneto na blagunovija žäläd. [Dynamics of the germination and emergence of *Quercus conferta* acorns.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (187-203). 9 refs. [Bulg.f.]

Laboratory investigations showed that temperatures of ca. 22° C. resulted in better germination and height growth than did those of 18°. Acorn weight had little effect on germination, but did affect height growth, the biggest acorns producing the tallest shoots.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 2773, 2775, 3089, 3121, 3464-7, 3471, 3475.

2885. ZIMMER, W. J. Our midget Eucalypts. *For. tech. Pap. For. Comm. Vict.* No. 5, 1960 (11-3).

Enumerates the small *Eucalyptus* spp. indigenous and widespread in Victoria, briefly outlining their environmental conditions, and distinguishes the following groups by size: (1) species rarely or never attaining tree dimensions, (2) species sometimes, (3) species usually, developing into small trees. Of scant economic value as timber, they are of great use as protection forest, and, in the lower rainfall zones, of value to bee-keepers.

2886. ŽILKIN, B. D. Ob uzko- i širokokronnyh sosnah v Belorusskoj SSR. [Narrow- and broad-crowned Scots Pine in Belorussia.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (17-21 + 1 dgm.). 10 refs. [Russ.]

Investigations were made on 656 trees in three mature stands of density ca. 0.75: (a) Pine/*Calluna*, site class III, age 105; (b) Pine/*Vaccinium vitis-idaea*, II, 110; (c) Pine/bracken/*Vaccinium myrtillus*, I, 110. Trees having crown diameters less than the mean for the relevant site class were classed as "narrow-crowned." It was found that, with increasing soil fertility and stand productivity, the mean, max., and min. crown diameters fell, the ratio of crown-diameter/d.b.h. fell, the ratio of tree-height/crown-diameter rose, and the % of narrow-crowned trees rose. Thus narrow-crowned trees formed 35% of (a), 44% of (b), and 99% of (c). Detailed analysis of 10 sample trees (one narrow- and one broad-crowned specimen of each yield

class in (b), aged 118 years) showed that narrow-crowned trees do not fruit well, but put on vigorous height increment between 100 and 120 years, have small branches in terms of % of stem weight, possess a greater heartwood %, have wood with rather better physical and mechanical properties, and have shorter but more abundant needles than broad-crowned trees.

2887. WALTERS, J. The branch arrangement of Western Hemlock (*Tsuga heterophylla* (Raf.) Sarg.). *Res. Note Fac. For. Univ. B.C.* No. 29, 1960. pp. 3.

Data from 13 trees sampled, representing different site classes, d.b.h., heights, and ages, and including seedlings, intermediates, co-dominants, dominants and open-grown trees, showed that the branch arrangement has a characteristic pattern. Termination of annual leader growth is usually marked by an exceptionally long branch, the 'sub-nodal' branch, produced immediately below the annual node; other branches tend to concentrate along the upper portion of the internode, below the sub-nodal branch.

2888. BAVNGAARD, A. De negatieve grene. ['Negative' branches.] *Dansk Skovforen. Tidsskr.* 46 (1), 1961 (8-18). [Dan.]

[Cf. F.A. 19 No. 2825.] Experiments on stripping the buds from Beech branches were continued in 1957-59. The thickest branch was still alive in 1959, whereas the thinnest had died in the winter of 1957-58 and the two intermediate ones between March and Oct. 1958. Photographs are given of cross-sections of the stems above and below the dead branches, showing the reduction in annual-ring width in the section underneath the branch and incipient furrow formation; after the death of the branch, ring width below it began to return to normal. Other photographs show reduced ring width under branches in Oak and Ash, although these species do not form furrows as clearly visible as those in Beech and Hornbeam.

2889. Growth characteristics of woody species in relation to environmental factors. *Extr. from Rep. For. Res. Glendon Hall Fac. For. Univ. Toronto 1959/60*, 1960 (5-6).

The experimental material for this series consisted of 700 trees of *Picea abies* from 5 provenances, grown in clay pots and subjected to various treatments. Analysis of the results indicated that the state of dormancy reached by a bud influenced the nature of the twig that developed from it. A twig that developed from a normal winter-dormant bud had a pre-determined number of internodes, and hence its growth potential was limited. Also its buds remained dormant until they had been chilled. In contrast, a twig that developed from a summer-dormant bud (under some such stimulus as an artificially long photoperiod) had an indeterminate number of internodes, and hence the amount and duration of growth were largely controlled by the current environment; the buds on the twigs also began to elongate soon after they were formed.

2890. ŠIRJAEVA, V. M. Osobennosti rosta nekotoryh drevesnyh porod v usloviyah srednego tečenija Amu-Dar'i i ih rol' v sozdanii irrigacionnyh lesonasaždenij. [Features of the growth of some woody species in the central part of the Amu-Darya valley, and their importance in the creation of irrigated stands.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (49-53). 4 refs. [Russ.]

Discusses height, diameter, root growth, etc. of *Morus alba*, *Ailanthus altissima*, *Populus nigra* and *P. bolleana*.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See No. 2885.

181.8. Phenology

See Nos. 2771, 2784, 2850, 2852, 2878, 2889, 2989, 3308, 3480.

182. Synecology, Plant Sociology: General, Principles and methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

2891. SANDMO, J. K. Problemer omkring furuskogens innvandring og dens senere tilbakegang. [Problems relating to the migration of Pine forest into Norway and its subsequent recession.] *Tidsskr. Skogbr.* 68 (3), 1960 (204-7). [Nor.]

^{C14} dating of a Pine stem found in a small lake situated at 1060 m. alt. showed that the sample was 8400 ± 200 years old. The implications of this dating are discussed.

2892. BEATLEY, J. C. The primeval forests of a periglacial area in the Allegheny plateau (Vinton and Jackson Counties, Ohio). *Bulletin of the Ohio Biological Survey, Columbus* 1 (1), 1959. pp. xi + 182 + 1 map. 76 refs. [With a check list of vascular plants by F. Bartley.] L.S.

A study of the original forest types before European settlement and their distribution in relation to factors of the environment, based on a study of the existing, secondary forests and old surveyors' records. Upland Oak communities, mesophytic ones of residual soils, White Oak communities of the lacustrine terraces, and communities of the swamp forest succession are the chief types distinguished. *From author's summary.*

2893. GRAHAM, A., and HEIMSCH, C. Pollen studies of some Texas peat deposits. *Ecology* 41 (4), 1960 (751-63). 33 refs.

Analysis of peat from the south Soefje bog suggests that Spruce (*Picea* spp.), possibly isolated during an earlier period of more significant climatic changes, existed near the bog until ca. 12,500 years ago, reflecting a relatively cool, moist climate at that time. Subsequent changes in the pollen profile are interpreted to indicate a gradual change, through a warm-moist period to the present warm-dry climate.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 2715, 2836, 2883, 2892, 2924, 2926, 3239-41.

2894. CORNER, E. J. H. **Impact of man on the vegetation of the humid tropics.** *Nature, Lond.* 189 (4758), 1961 (24-5).

Reviews the papers read, and recommendations passed, at a symposium held in Sept. 1960 at Garoka, New Guinea, convened by the Unesco S.E. Asia Science Co-operation Office. Subjects ranged over pedology, climatology, ethnobotany, and the effects of man on vegetation (notably on forests).

2895. SMITH, C. M. **Patterns of forest regrowth.** *Proc. N.Z. Ecol. Soc.* No. 7, 1960 (1-8). 3 refs.

An address covering the general subject of succession, with illustrations from New Zealand conditions and suggestions for desirable lines of research in that country.

2896. MILES, M. L., and SMITH, E. C. **A study of the origin of Hemlock forests in southwestern Nova Scotia.** *For. Chron.* 36 (4), 1960 (375-90). 29 refs.

A study of neighbouring forest stands, 70, 150, and 300 years old, was made in the Hemlock [*Tsuga canadensis*] area of N.W. Nova Scotia. Soils, drainage, and climate were similar. Evidence pointed to fire as the agent in the removal of the original forest in the case of the two younger stands. The number of trees of short-lived species decreased with the age of the stand, and the abundance and distribution of Hemlock indicated its ultimate dominance. From trends apparent in the younger stands, it appears that, having reached an age of 300 years, their composition will be similar to the present composition of the 300-year-old stand. It is concluded that fire may play a major role in the initiation of the development of pure Hemlock stands. *From authors' abstract.*

2897. KILBURN, P. D. **Effects of logging and fire on xerophytic forests in northern Michigan.** *Abstr. in Bull. Ecol. Soc. Amer.* 40 (4), 1959 (119). A.P.B.

Analysis of General Land Office Survey notes of Cheboygan County, Michigan, indicates that on sandy soils three forest types originally predominated: (1) Jack Pine, (2) Hemlock/Pine, and (3) Pine/Oak. Each type was affected differently by the softwood logging and recurrent fires of 1870-1920. Most sharply affected was (2), which is today dominated by Bigtooth Aspen, and on which the original type will probably not return for at least 200 years; (3) was stripped of its softwoods and will require a similar interval to recover; (1) was little affected by early settlement and for the most part remains intact.

2898. SMIRNOV, V. V. **Proishozhdenie, razvitie i smena pokolenij osinnikov v nagornyh dubravah južnoj lesostepi.** [Origin, development and succession of Aspen stands in upland Oak forests of the southern forest-steppe zone.] *Soobšč. Inst. Les.* No. 11, 1959 (51-70). 20 refs. [Russ.]

[Cf. F.A. 22 No. 348.] A report of findings in the Tellerman forest. Oak is succeeded by Aspen only on felled areas; on small ones, the Oak soon reasserts its dominance, and may do so eventually even on bigger and older areas of Aspen; in this zone, Aspen acts as a kind of pioneer. Silviculture should be directed to removing any Aspen before the Oak stand is felled; succession by Aspen is possible in certain forest types and not in others, e.g. it takes place in Oak/*Aegopodium podagraria*/*Carex* types, and is also possible in Oak/*A. podagraria* types.

182.4. Layer Communities

See also Nos. 2901-2.

2899. HERBERT, D. A. **Natural air-layering in humus-collecting epiphytes.** *Queensland Naturalist, Brisbane* 16 (1/2), 1958 (22-3). L.S.

Hosts of *Platyserium* species (epiphytes whose leaves form a receptacle for litter, which develops into a peat-like substance that is both moist and well drained) were observed to produce aerial roots in this substrate. Examples given include a *Macadamia ternifolia*, which sent a root 1 in. thick and ca. 1 ft. long, into the peat of *P. grande*; a *Brassia actinophylla*, which sent a root 3 in. thick, through a large *P. alcorni* on one of its branches down to the ground 9 ft. below; vines, and *Ficus* spp.

182.5. Synecological Measurements and Methods

See also Nos. 3498-9.

2900. KALAMEES, K. **Seente uurimise metoodikast ja nende tähtsusest füütöösöösides.** [Significance and methods of studying fungi in plant communities.] *Eesti NSV Tead. Akad. Toimet. (biol. Seer.)* 1960 (4), (333-42). 18 refs. [Est.russ.g.] W.A.H.

Describes a method of sampling fungus and other plant associations based on quadrats of varying size. The method, using quadrats of 1000 sq. m. for fungi, 100 sq. m. for trees and shrubs, and 9 sq. m. for herbs, grass, and moss, was applied in a comparison of the fungal communities of two forest types in S.W. Estonia, (a) *Pinetum myrtillosum* and (b) *Piceetum myrtillosum*, each with 3 sub-types. The fungal communities of (a) and (b) were clearly distinguished (data tabulated), *Rozites caperata* and *Lactarius rufus* being typical of (a) and *Lactarius camphoratus* and *Tricholoma inamoenum* of (b). The fungus communities appeared to be characteristic only of the dominants of (a) and (b), however, and showed no distinction between subtypes.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

2901. AL'BYČKA, M. O. **Osoblyvosti travostoju štučnyh lisiv stepovoi zony URSR.** [Characteristics of the herb layer of forest plantations in the steppe zone of the Ukraine.] *Ukr. bot. Ž.* 17 (2), 1960 (61-9). 8 refs. [Ukr.russ.e.] A.P.B.

Discusses stages in the development of the herb layer in plantations of various hardwoods (e.g.

Oak, Ash, or mixtures of the two, *Robinia pseudo-acacia*, *Gleditsia triacanthos*) in relation to age, crown closure, type of stand, growth conditions, etc. The flora within the stands is poor, and the absence of competition from light-demanding steppe grasses favours the spread of forest and steppe weeds.

2902. SCAMONI, A. Kiefernforstgesellschaften. [The plant communities of artificial Pine forests.] *Forst u. Jagd* 10 (11), 1960 (542-4, 559). [G.]

Briefly describes such communities (as found in E. Germany) in relation to the natural or former vegetation of the site, site quality, stand age and structure, etc. and discusses their value as indicators of site conditions and desirable treatments.

187. Vegetation Types

See also Nos. 2662-3, 2669, 2693, 2695-6, 2701-2, 2715, 2892, 3064-5, 3936, 3941.

2903. TALLÓS, P. Az erdőtipológia és a növény-társulástan kapcsolata. [The relation of forest typology and plant sociology.] *Erdő* 9 (6), 1960 (205-13 + smries. in suppl.). 15 refs. [Hu.russ.g.]

The author shows [for Hungary] the corresponding plant association in 8 moisture grades (from hyperxerophilous to ultrahygrophilous) for Spruce, Beech, Beech/Hornbeam/Oak, mountain and plains Oak, Birch/Alder, Poplar/Willow, Scots and Austrian Pine, and Robinia forests.

2904. SOO, R. Magyarország erdő-társulásainak és erdő-típusainak áttekinése. [Conspectus of Hungarian forest associations and types.] *Erdő* 9 (9), 1960 (321-40 + smries. in suppl.). Many refs. [Hu.russ.g.]

Of the 50 forest and shrub associations of the Transdanubian central mountains and plain (presented in 164 pages of tables, according to altitude, soil acidity and moisture) only 22 are of practical importance. Within these there are ca. 70 important types. An index of dominant tree species leads to all associations concerned.

2905. PAVARI, A. Die natürlichen Waldzonen des Apennins. [The natural forest zones of the Apennines.] *Forstwiss. Cbl.* 79 (11/12), 1960 (333-45). [G.]

A lecture given on 2 July 1959 at Munich.

2906. PHOTIS, D. G. Phytogeographikai paratérseis epi tou oreinou synkrotématos Tymphrestou-Oxyas. [Phytogeographical observations on the Timfristos-Oxia mountain massif.] *Das. Chron.* 2 (25), 1960 (1099-1105). 11 refs. [Gk.]

The massif, which in these two peaks reaches a height of 2315 and 1926 m. respectively, was surveyed in July 1959, and in July and Oct. 1960. Five zonal formations are distinguished, viz. sclerophyllous-evergreen, broadleaved-deciduous, coniferous, mountain-pasture and alpine, each of which is described floristically in some detail. In the second formation, where, on Mt. Oxia, is found the southernmost station for European Beech, *Fagus sylvatica* predominates, with a few *F. orientalis* and many *F. moesiaca*; it forms closed stands between 1400 and 1800 m. but is found down to ca. 1300 m.

2907. HORVAT, I. Sistematski odnosi termofilnih hrastovih i borovih šuma Jugoistočne Evrope. [Systematic relations of thermophilous Oak and Pine forests of south-east Europe.] *Biološki Glasnik, Zagreb* 12 (1/2), 1959 (1-40 + 2 tpls.). 71 refs. [Croat.g.russ.] BL.U.

Describes the relationship, characteristics, distribution and species composition of plant associations divided broadly into: *Ostryo-Carpinion orientalis*; *Quercion confertae*; and *Orneto-Ericion*.

2908. GAJIĆ, M. R. O nekim karakteristikama asocijacije *Querceto-Carpinetum serbicum* Rudski. [Some characteristics of the association *Querceto-Carpinetum serbicum*.] *Šum. List* 84 (7/8), 1960 (231-4). 10 refs. [Croat.g.]

Describes, and distinguishes between, mesophilous (>400 m. alt.) and thermophilous (up to 400 m.) forms of this association, for which the names subass. *typicum* prov. and subass. *quercetosum confertae* prov. are respectively proposed.

2909. JOVANOVIĆ, B. O šumi planinskog javora na Goču. [The Acer heldreichii stand on Goč Mountain.] *Arhiv Bioloških Nauka, Srpsko Biološko Društvo, Beograd* 9 (1/4), 1957 (15-32). [Serb.g.] From *abstr. in Biol. Abstr.* 35 (20), 1960 (No. 54921).

These Maples are var. *pančićii* and occur only at ≥1300 m. alt., above the upper limit of the *Abieto-Fagetum*, in association with Beech. The floristic composition of the association is analysed and it is classified as *Acereto-heldreichii Fagetum* Jov. prov.

2910. TIKHOMIROV [TIHOMIROV], B. A. Plant-geographical investigations of the tundra vegetation in the Soviet Union. *Canad. J. Bot.* 38 (5), 1960 (815-32). 156 refs. O.R.S.

A bibliographical review of Russian studies with a view to improving arctic agriculture, e.g. by enlarging and improving pastures and meadows and planting trees in areas suitable for afforestation.

2911. KARPENKO, A. S. Osobennosti rastitel'nogo pokrova Pskovskoj oblasti v svyazi s osnovnymi faktorami geografičeskoy sredy. [Features of the vegetation of the Pskov region as related to the main factors of the geographical environment.] *Bot. Ž.* 45 (5), 1960 (667-83). 34 refs. [Russ.e.]

Discusses the relation of the vegetation of the region (which embraces (1) the southern taiga, and (2) the conifer/hardwood forest subzone) to the main geographical factors (climate and soils). The author subdivides (1) into 8, and (2) into 11 regions, and discusses particularly the position of the boundary between (1) and (2).

2912. TYŠKEVIČ, G. A. Tipy elovyh lesov Sovetskikh Karpat i ih vozobnovlenie. [Spruce forest types of the Soviet Carpathians and their regeneration.] *Lesn. Ž.*, *Arhangel'sk* 2 (4), 1959 (14-23). [Russ.]

Short notes on each of the 10 Spruce forest types, which together cover ca. 642,000 ha. The system of forest type classification used is that of Pogrebnjak and Vorobjev [see *F.A.* 18 Nos. 1407-8].

2913. MAHATADZE, L. B. O primenenii lesnoj tipologii v ustrojstve gornyh lesov. [The use of

forest typology in the management of montane forests.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (15-21). 10 refs. [Russ.]

A general discussion, illustrated with examples mainly referring to Armenian Oak forests [cf. *F.A.* 20 No. 1610].

2914. PURI, G. S. Indian forest ecology. A comprehensive survey of vegetation and its environment in the Indian subcontinent [Vols. I & II]. Oxford Book & Stationery Co., New Delhi and Calcutta. 1960. pp. 710. Many refs.

A two-volume work intended as a critical summary of most of the important botanical and ecological literature so far published on Indian vegetation, and as a reference book for teachers and workers engaged on different aspects of ecological research. Section A presents basic facts of the Indian flora and its environment, with chapters on the geographical and geological histories of Indian vegetation and the classification of Indian and tropical vegetation. Section B describes and classifies Indian vegetation, on the basis of "Forest Types of India" by H. G. Champion (who contributes the preface), incorporating much material published after 1938. Section C includes chapters on climate, microclimate, geology and soils and their relationships to the vegetation, in which the rôle of man and domesticated animals in relation to vegetational development and succession is stressed.

2915. DAKSHINI, K. M. M. The vegetation of Mothronwala swamp forest (plant communities of swampy zone). *Indian For.* 86 (12), 1960 (728-33). 3 refs.

2916. MATHUR, C. M. Forest types of Rajasthan. *Indian For.* 86 (12), 1960 (734-9). 2 refs.

The important types are dry Teak and *Anogeissus pendula* forest.

2917. LEGRIS, P. Contribution à l'étude écologique des types de végétation du sud de l'Inde. I. Écologie; II. Végétation; III. Annexes. [An ecological study of the vegetation types of South India. I. Ecology; II. Vegetation; III. Appendixes.] Thesis, Faculté des Sciences de Toulouse. 1960. pp. 197 + 3 gphs., 3 maps. 139 refs. [F.]

The area dealt with is continental India south of latitude 12°.

2918. MONTERO, R. F. R. Panorama forestier de l'Angola. [A forestry panorama of Angola.] *Bois For. Trop.* No. 75, 1961 (2-16). 8 refs. [F.e. span.]

Describes the various plant formations and the main characteristic species.

2919. RITCHIE, J. C. The vegetation of Northern Manitoba. IV. The Caribou Lake region. *Canad. J. Bot.* 38 (2), 1960 (185-99). 12 refs. O.R.S.

An account of the flora of the Caribou Lake region, with a vegetation map and a key to the appearance of main vegetation types on aerial photographs. The evidence suggests that the mesic sites now supporting a tundra community dominated by ericoid shrubs were once occupied by trees, which have been removed by fire. Recent alluvium

carries stands of *Picea glauca*, which shows good growth. Shallow wet peats are covered by stands of *Picea mariana* with shrubs and mosses. Deeper peats, usually with shallow active layers, bear heath or sedge/cottongrass tundra. [Cf. *F.A.* 19 No. 202.] *From author's summary.*

2920. RITCHIE, J. C. The vegetation of northern Manitoba. VI. The Lower Hayes River region. *Canad. J. Bot.* 38 (5), 1960 (769-88). 25 refs. O.R.S.

The chief vegetation types on mineral substrata of alluvial and marine deposits are salt-marsh, shrub (dominated by *Salix* spp.), forests of *Populus balsamifera*, and forests of *Picea glauca*. On the extensive peat substrata there are bog and fen types. In the former are distinguished two communities dominated by *Picea mariana*: (1) Lichen muskeg, with a ground layer of *Cladonia* and *Ledum*; (2) moss muskeg, with *Pleurozium* and *Ledum groenlandicum* as ground-layer dominants. On shallower peats, fens predominate, with *Larix laricina* and *Betula glandulosa* as the dominant phanerophytes. These types have been distinguished on vertical aerial photographs, and their photographic characteristics are summarized. A detailed vegetation map illustrates their chorology. *From author's summary.*

2921. PEARSON, P. R., JR. New Jersey limestone vegetation. *Abstr. of thesis, in Dissert. Abstr.* 21 (5), 1960 (1033). O.R.S.

Quercus alba, *Q. velutina*, *Acer saccharum* and *Tsuga canadensis* were the dominant species in a series of forest stands studied. These were classified as: (1) sub-xeric or Oak-dominated, (2) sub-mesic or dominated by *A. saccharum*, and (3) mesic or dominated by *T. canadensis*. A study of successional trends by examining numbers of seedlings, saplings and small trees indicated that Maple is replacing the Oaks and that Hemlock and Maple will probably share dominance in the future.

2922. BEALS, E. W., and COTTAM, G. The forest vegetation of the Apostle Islands, Wisconsin. *Ecology* 41 (4), 1960 (743-51). 17 refs.

A survey of the vegetation on a group of 22 islands in Lake Superior. The most common type was dominated by either *Betula lutea* or *Thuja occidentalis*.

2923. BENNINGHOFF, W. S., and GEBBEN, A. I. Phytosociological studies of some Beech/Maple stands in Michigan's Lower Peninsula. *Pap. Mich. Acad. Sci.* 45, 1959 (1960), (83-91). 5 refs. L.S.

An analysis of tree species by frequency and importance suggests that the Beech/Maple communities are edaphically selected segregates within the Oak/Hickory region in the South, and within the Hemlock/White Pine/northern hardwoods in the North.

2924. LAESSLE, A. M., and MONK, C. D. Live Oak forests of northeastern Florida. *Abstr. in Bull. Ecol. Soc. Amer.* 41 (3), 1960 (88). A.P.B.

In N.E. Florida, *Quercus virginiana* forms small but important communities on both inland and coastal sites. Inland, these are found on sandhills,

in the better drained Pine lowland areas, on scrub sites and fringing lakes, streams and sinkholes. In these conditions, with an occasional fire, Live Oak may persist over an extended period. In mature Live Oak stands that had been free from fire for some years, species of the climax mesic hammock began to appear. It is suggested that the Live Oak stands of both inland and coastal areas of N.E. Florida represent an extended subclimax maintained partly by fire and partly by the longevity of the species.

2925. GUZMÁN, H. G., and VELA GÁLVEZ, L. Contribución al conocimiento de la vegetación del suroeste del estado de Zacatecas. [The vegetation in the S.W. of Zacatecas State.] *Boletín, Sociedad Botánica de México, Mexico City* No. 25, 1960 (46-61). 14 refs. [Span.span.]

Describes 5 types in central Mexico. In No. 2 (Oak/Pine forest), 3 species of *Quercus* are dominant at 2500-2600 m., above which, to 2700 m., is a forest of 6 Pine species mixed with Oak and *Arbutus*. Rainfall is ca. 1000 mm. Medicinal, food, forage, and poisonous plants, and edible and poisonous fungi, are listed.

2926. ATKINSON, I. A. E. Forest vegetation of the inner islands of the Hauraki Gulf. *Proc. N.Z. Ecol. Soc.* No. 7, 1960 (29-33). 10 refs.

Describes forest remnants and the primitive

vegetation and colonization of lava flows, and discusses the probable causes of discontinuity in the vegetation pattern.

2927. GILLHAM, M. E. Plant communities of the Mokohinau Islands, northern N.Z. *Trans. Roy. Soc. N.Z.* 88 (1), 1960 (79-98). 9 refs. O.R.S.

2928. WARDALE, P. The subalpine scrub of the Hokitika catchment, Westland. *Trans. Roy. Soc. N.Z.* 88 (1), 1960 (47-61). 4 refs. O.R.S.

Recognizes and describes the following types of community: (1) *Hoheria glabrata* forest, on young, moist, freely drained, deep soils; (2) *Olearia* forest on similar but slightly more mature soils; (3) *Olearia colensoi* scrub, on shallow, usually immature, freely drained soils on steep slopes; (4) *Dracophyllum uniflorum* scrub, on shallow soils on exposed ridges and spurs; (5) *Dacrydium biforme* scrub, on poorly drained soils. *H. glabrata* grows quickly and regenerates freely. *D. biforme* and other shrubs grow very slowly and do not often reproduce from seed, though they are long-lived and some species reproduce vegetatively through downhill layering. The true scrub communities have been little modified by deer and chamois, except at the upper margins and along main ridge tracks. Browsing is preventing the establishment of new *H. glabrata* forest. Opossums and fire are minor factors. From author's summary.

2. SILVICULTURE

2929. PEACE, T. R. The dangerous concept of the natural forest. *Quart. J. For.* 55 (1), 1961 (12-23). 13 refs.

Stresses the danger of adopting the concept of natural forest as a basis for silviculture, and gives instances where silvicultural practice based on the attributes of the natural forest may lead to worse rather than better growth. [Cf. F.A. 18 No. 4204.]

2930. KOTZÉ, J. J. The management of Pine stands for pulpwood. *J. S. Afr. For. Ass.* No. 35, 1960 (3-9). 3 refs.

An outline of methods advocated for the establishment and management of *Pinus patula*, *P. elliottii* and *P. taeda* plantations (site quality II, m.a.i. 250-275 cu. ft./acre) in the Midlands of Natal, viz. plant at 7 x 7 ft. (890 trees/acre); thin at 11 and 16 years to 500 and 300 trees; clear fell at 25 years; prune at 6-7 years up to 7-8 ft. Yields to 3 in. u.b. should be 9-7, 14-5 and 58-0 oven-dry tons/acre respectively from the two thinnings and the final felling, a total of 82.2 tons or 6570 cu. ft.

2931. BROWN, J. M. B. The Corsican Pine in its native island. *Emp. For. Rev.* 39 (4), 1960 (422-36). 12 refs.

Some measurements of height and girth in even-aged stands on good sites in the forests of Aitone and Valdo-niello are compared with similar sets of measurements reported by others. Substantial areas of roughly even-aged (often 150-200 years) high forest were noted, but a selection system was adopted some years ago in place of the shelterwood

system formerly practised. The reasons for the long rotation of 300 years are briefly considered, and the problems of Corsican Pine regeneration in relation to physiographic factors, method of management and competition from Beech, Silver Fir and bracken are discussed. The characteristics of seed-source stands near the forest of Valdo-niello are outlined. The significance of provenance differences in seed introduced into Britain is reviewed in relation to the health of Corsican Pine on British upland sites, to which a provenance from high altitude might prove best suited. [Cf. F.A. 22 No. 1504.] From author's summary.

2932. XIMÉNEZ DE EMBÚN Y GONZÁLEZ ARNAO, J. El pino piñonero en las llanuras castellanas. [Pinus pinea in the plains of Castile.] *Hoja divulgadora, Sección de Capacitación, Dirección General de Coordinación, Crédito y Capacitación, Ministerio de Agricultura, Madrid* No. 11-59H, 1959. pp. 20. [Span.]

Presents short notes on the characteristics of the tree, methods of artificial and natural regeneration, the development and tending of stands, production of 'nuts' and timber, and on management and exploitation.

2933. AVERKIEV, S. K. Sohraniti' cennye hurmovye lesa Talyša. [Preserve the valuable Diospyros lotus forests of the Talysh region [Azerbaijan].] *Lesn. Hoz.* 12 (6), 1960 (17-8). [Russ.]

An account of the serious over-cutting of *D. lotus* during the 20th century, and of post-war

attempts at conservation and stand establishment. Artificial stands have largely failed, owing to lack of knowledge on the requirements of the tree. It favours E. aspects below 600 m. alt., and demands moist, fertile, well drained soils.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 2942, 3120, 3143, 3219, 3457, 3961.

2934. GRANO, C. X. Shortleaf-Loblolly reproduction losses moderate following seed tree felling. *J. For.* 59 (1), 1961 (24-5). 1 ref.

The belated removal of 22 seed-trees/acre resulted in a reduction of milliacre stocking from 84 to 70.2% in the 18-year-old regeneration of *Pinus echinata* and *P. taeda*. Details are tabulated. Considering the b.a. and volume cut, the area damaged was much less than had been expected.

222. Coppice, Pollarding and Lopping Systems

See Nos. 2935-7, 2968.

226. Changes of Silvicultural System.

Conversion (by System or Species)

See also Nos. 3068, 3934.

2935. NORMAND, A. La mévente des taillis et l'évolution de la forêt française. [The uneconomic price of coppice and the development of French forest.] *Bull. Soc. For. Franche-Comté* 31 (4), 1960 (179-86). [F.]

Because of the poor demand for coppice wood, it is estimated that there is a loss of NFr. 10-15 per cu. m. felled. The author propounds the remedy practised in the department of Nièvre, viz. leaving the coppice standing, felling the standards, and thereafter thinning, enriching with conifers, or simply leaving the coppice for 20, 25, or 30 years, when it will provide a good crop of poles interspersed with groups of seedling regeneration in the gaps left when exploiting the standards.

2936. POGGI, U. Considerazioni sulla trasformazione dei cedui di faggio a taglio raso mediante l'introduzione del taglio a sterzo. [Conversion of Beech coppice from management by clear felling to a selection system.] *Ital. for. mont.* 15 (5), 1960 (193-7). [It.f.]

Describes a method employed successfully in the province of Lucca: during the period of conversion, three selection fellings of equal intensity are made at intervals equal to the felling cycle to be established. At each operation the volume removed should equal the normal amount for a selection felling plus one-third of the difference between the normal production of clear-felled and selection coppice.

2937. PENEV, N., and VLASEV, V. Izučvanija vārhu prevāštaneto na njakoi izdānkovi tipove gora vāv visokostāblēni na osnovata na estestvenoto semenno vāzobnovjavane. [Investigations on the conversion of some coppice types into high forest by natural regeneration from seed.] *Nauč. Trud.*

Lesoteh. Inst., Sofija No. 8, 1960 (5-32). 17 refs. [Bulg.g.]

Compares two methods of converting coppice of (1) dry-type *Quercus conferta*, (2) dry to fresh *Q. sessiliflora*, (3) as (2) plus Hornbeam, and (4) dry to fresh *Q. sessiliflora*/Hornbeam/Beech; these were (a) felling, leaving seed-trees, and (b) extending the rotation (from 20-30 to 50-60 years) and thinning, so achieving advance growth from seed under the canopy. Ten years' observation has shown method (b) to be definitely superior: regeneration from seed of the main tree species was 4.5 times more abundant in (1), 13.6 times in (2), 19.5 times in (3), and 1.9 times in (4). The reasons for the superiority of (b), viz. more uniform seed distribution, litter to cover the acorns, the presence of a forest environment, reduced coppicing, etc., are discussed and its adoption recommended for future conversion work.

2938. PEŘINA, V. Přeměny borových monokultur na pleistocenních terasách. [The conversion of pure Scots Pine stands on Pleistocene terraces.] Výzkumný Ústav Lesního Hospodářství a Myslivosti, ČSAZV, Prague, 1960. pp. 212. 293 refs. [Cz.cz.russ.g.e.] Price: Kčs 10.80.

An account of experiments on pure Scots Pine at Opočno on a 2000-ha. site: poor, sandy, podzolized soil with no pronounced horizons, water table at a depth of ca. 5 m., altitude 250-300 m., mean annual precipitation 648 mm., mean annual temperature 8.2°C. The history of the site, the five Pine forest types, and attempts at conversion are reviewed in detail. The best conversion method is group fellings, regenerating artificially with ameliorative species. Silver Fir, Hornbeam, Lime, Beech, Oaks, Birch, Alder, Norway Spruce, and lupins have all been tried, and information is given on their relative suitability for the various forest types; thus only Oak and Birch are possible in the dry type, Beech (with some qualifications) in the fresh type, Lime and Hornbeam for the moister and richer types, etc. It appears, however, that Scots Pine will continue to be the main species on this site.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 2688, 2929, 3091, 3434, 3494.

2939. KOLPIKOV, O. M. Osobennosti svetovogo režima v biograppah sosny različnyh gustot. [Features of the light regime in groups of Scots Pine of various densities.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (32-6). 1 ref. [Russ.]

Part of a study already noticed [cf. F.A. 21 No. 4226]. Groups of 10 plants/sq. m. at 10 years of age are the best.

2940. DONOV, V. Izučvanija vārhu smesenie nasaždenija ot ela i buk. [Studies on Silver Fir/Beech stands.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (33-51). 20 refs. [Bulg.g.]

From studies on distribution, structure, yield and regeneration, concludes that pure Fir yields more timber than Fir/Beech, which is in turn better than pure Beech; increasing the % of Fir is therefore held

to bring about qualitative and quantitative increase in yield, while not impairing soil properties. The tendency for Beech to replace Fir is the result of past mismanagement, and the aim should be to reverse this trend. Proposals are made for the correct management of mixed stands, particularly with regard to regeneration fellings and thinning.

2941. FRITZ, E. **Characteristics, utilization and management of second-growth Redwood [*Sequoia sempervirens*]**. Foundation for American Resource Management, San Francisco, Calif. 1959. pp. 29 + 12 photos. 15 refs.

Describes the origin, structure, silvicultural character, increments and pests of the extensive stands composed mainly of *S. sempervirens* regenerated naturally after logging. Even at 100 years old, the wood is coarse-grained compared with the old mature timber. Recommendations are made for managing and utilizing this resource and overcoming the prejudice against it.

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 2934, 2937, 2940, 2982, 3143, 3643.

2942. MUŠEGJAN, A. M. Rubki glavnogo pol'zovanija v pihitovyh drevostojah Vostočnogo Kazahstana. [Principal fellings in the Siberian Fir stands of E. Kazakhstan.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (43-8). 1 ref. [Russ.]

Analyses the condition of 30 felling areas, the oldest fellings dating from 1928, and covering ca. 2400 ha. in all. Between 59 and 90% of the standing volume had been removed on the various areas. On 9 areas (900 ha.), advance growth was present and forest regeneration was assured; on 4 areas (500 ha.), the Fir had been succeeded by Birch and Aspen; on 17 (1000 ha.), regeneration was either absent or poor. After succession to broadleaved species on clear fellings, the Fir regeneration cycle takes some 150 years. Both clear-felling and selection systems are unsuitable for the Fir stands, and shelterwood management is advised.

2943. FALALEEV, È. N. Estestvennoe vozobnovlenie pihitovyh lesov, povrezhdennyh sibirskim šelkoprijdom. [Natural regeneration of *Abies [sibirica]* forests damaged by *Dendrolimus sibiricus*.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (35-7). [Russ.]

The amount of natural regeneration was studied in several flood-plain forests of various ages in Krasnoyarsk, predominantly Fir but with some other conifers and hardwoods. In stands where $>10\%$ of the trees are dead, the shrub and ground vegetation does not change significantly, and Fir regeneration is normal. With 10-30% mortality, the shrub and ground vegetation becomes denser but does not prevent Fir regeneration. With 70-80% mortality, Fir seedlings become very sparse and slow to develop. If all the parent stand is killed, the area degenerates to a dense, shrubby waste.

2944. CHURCH, T. W., JR. **Residual stand density and the early development of northern hardwood**

reproduction in Upper Michigan. *Tech. Note Lake St. For. Exp. Sta.* No. 593, 1960. pp. 2.

In a study begun in 1951 in a northern hardwood stand in Upper Michigan, plots were cut to stocking levels of 30, 50, 70, and 90 sq. ft. b.a./acre in trees ≥ 10 in. d.b.h. Before felling, % species composition was: Sugar Maple 77, Yellow Birch 14, Beech 5, Red Maple 3, and other hardwoods 1. Reproduction counts were made 2 and 5 years after logging. It was found in both years that Sugar Maple was the predominant species, accounting for 90% of seedlings and 75% of saplings. A significant increase occurred in the total number of seedlings and saplings from 2 to 5 years after felling. For Yellow Birch, residual stand densities of 30 and 50 sq. ft. b.a. gave a greater increase in % of stocked quadrats than did denser overstoreys. Residual stand density had no effect on the % of quadrats stocked with Sugar Maple, nor did it affect the total number of seedlings and saplings present at either count.

2945. DECIE, T. P., and FRASER, A. R. **Miscellaneous notes on scarification trials, Prince George forest district, 1956 to 1959.** *Res. Note B.C. For. Serv.* No. 36, 1960. pp. 22. 1 ref.

Subjects discussed included choice of equipment (with some results for different equipment tested), operating techniques, training, and assessment of quality of the work.

2946. MGEBOV, G. G. K voprosu o lesovodstvennoj i ékonomičeskoj éffektivnosti mehanizirovannoj podgotovki počvy na koncentrirovannyh vyrubkah. [The silvicultural and economic effectiveness of mechanized tillage on concentrated clear fellings.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (38-43). [Russ.]

A comparison of time and costs of ploughing, and of preparation of patches by scarifier and by hand, to the clear advantage of the mechanized methods.

2947. DERJABIN, D. I. Prispособlenie, osobennosti ispol'zovanija i éffektivnost' borony BDT-2,2 na lesnyh rabotah. [Description, use, and efficiency of the BDT-2.2 harrow in forestry.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (44-8). 1 ref. [Russ.]

Describes this heavy, tractor-drawn, 2-section tandem disk-harrow, the maximum working width of which is 2.2 m., and its use and effectiveness in making firebreaks, scarifying to assist natural regeneration, and preparing the soil for artificial regeneration on clear fellings.

232. Artificial Regeneration

See also No. 2835.

2948. BUBLYS, K. Minkštųjų lapuočių medynuose ūkio organizavimo klausimu. [The economic management of some soft-wooded deciduous trees.] *Liet. Miškų Ūkio Moksl. Tyr. Inst. moksl.-tech. inform. Biul.* No. 1, 1959 (10-2). [Lith.]

The most important of these in Lithuania are Poplar, Birch and Alder, which contribute 16% of the country's total consumption of timber (170,000 cu. m. annually—84% going to make furniture, 61%

matches) and 40% of her wood fuel. To reduce imports, the author recommends planting plus-stock of these species, and gives plant indicators for the most suitable sites. They should be tried both pure and in mixture.

232.1. Choice and Trial of Species, Races etc.

See also No. 3218.

2949. PAPP, J. A keleti gyertyán. [*Carpinus orientalis*.] *Erdő* 8 (6), 1959 (238-9 + smries. in suppl.). [Hu.russ.g.]

Briefly discusses the present rôle of *C. orientalis* in Hungarian forestry, and, in view of its drought-resistance, makes suggestions for its use in afforestation of poor sites (e.g. dry and rocky slopes).

2950. SZIGETHY, B. Gyorsan növekvő fajok telepítésének lehetőségei a Keletbükk Erdőgazdaság területén. [Possibilities of planting fast-growing woody species in the Kelet-Bükk forest region.] *Erdő* 8 (8), 1959 (308-11 + smries. in suppl.). [Hu.russ.g.]

Greater possibilities were found on the agricultural areas. The Aspens [N. American] and Alders deserve most attention whereas Robinia, much planted on unsuitable sites, is falling into disfavour. Particularly along watercourses, e.g. in the land-use plan of the Hernád valley, great opportunities exist for the large-scale planting of *Populus* × *canadensis*.

2951. TÓTH, I. A Dunaártéri erdőgazdálkodás egyes kérdései. [Some questions on the economy of the Danube flood-plain forests.] *Erdő* 9 (7), 1960 (253-7 + smries. in suppl.). [Hu.russ.g.]

Contains tabulated statistics of area and yield by species and their values. Ca. 1/3 of the forest area is suitable for Poplars; these provide the greatest volume and value yields, which could be still further increased. Improvements in Willow cultivation lie in breeding, the abolition of the coppice system, and timely tending. Oaks, if planted, should be mixed with Poplars; game control is an important prerequisite.

2952. SIPOS, S. Gyorsan növekvő fajok Békés megyében. [Fast-growing species in Békés County.] *Erdő* 8 (3), 1959 (102-8 + smries. in suppl.). [Hu.russ.g.]

This county, with the best soils in Hungary, contains only 1.1% of its forests, but important additional timber production is possible. Only 35% of the area devoted to fast growing species carries Poplars, a figure which should be raised to 55-60%. The opportunities are tabulated. It should be possible to establish a paying fibreboard plant of 25-30 thousand cu. m. capacity in this region within 15 years.

2953. TÓTH, B. Nyarfatermelési tanulságok a püspökladányi szikkisérleti telepen. [Experience in growing Poplars at the "szikk" soils experiment station, Püspökladány.] *Erdő* 9 (2), 1960 (49-59 + smries. in suppl.). [Hu.russ.g.]

Gives soil properties and growth-data tables. A relatively high pulpwood production is possible in

10-15 years on these soils, and Poplar is considered a better economic proposition than the Pedunculate Oak hitherto favoured. As, however, this can be proved only by long and difficult trials, an initial mixture of Oak and Poplar is advised.

2954. BABOS, I. Az akácellenességről. [Opposition to *Robinia pseudoacacia*.] *Erdő* 8 (8), 1959 (295-301 + smries. in suppl.). [Hu.russ.g.]

The author supports with economic data the case for mixed Robinia/conifers against pure Robinia on site qualities V-VI. The drought-resistant White Poplar should be added to the mixture.

2955. NAGY, L. A tövis nélküli akác elterjesztése. [Increased use of the thornless *Robinia*.] *Erdő* 9 (1), 1960 (7-9 + smries. in suppl.). 9 refs. [Hu.russ.g.]

Many fine specimens in the Budapest streets indicate that this variety [*R. pseudoacacia* var. *inermis*] should be taken up for breeding. It is recommended for pasture land and for soils not suited to the common Robinia.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 3039, 3218, 3934.

2956. VUOKILA, Y. Siperialaisten lehtikuusi-koiden kehityksestä ja merkityksestä maamme metsätaloudessa. [On development of Siberian Larch stands and their importance to forestry in Finland.] *Commun. Inst. For. Fenn.* 52 (5), 1960. pp. 111. 103 refs. [Fie.e.]

A study was made of permanent and temporary sample plots, and the data were compared with those for native species (Scots Pine, Norway Spruce, Common and White Birch). Height, diameter, basal area, and volume increment and dry-matter production were measured, and it is concluded that this species is a valuable addition to the scanty selection of tree species in the forests of Finland.

2957. RADULOVIĆ, S. Duglazija u svetlosti njenoga razvoja na Avali. [Douglas Fir in the light of its development on Mt. Avala.] *Šumarstvo* 13 (9/10), 1960 (415-24). 14 refs. [Serb.f.]

Presents further data from the sample plots at Avala [cf. *F.A.* 14 No. 3259]. Measurement in autumn 1957 of 148 *Pseudotsuga taxifolia* var. *viridis* stems (out of 241 coniferous and deciduous trees growing on a 0.4-ha. plot), at 48 years old, showed means of 18.84 m. height, 24.6 cm. d.b.h., and 0.5 cu. m. volume. No other species grew as fast, and earlier findings that Douglas Fir was a valuable species for planting or improvement purposes on similar *Querceto-Carpinetum serbicum aculeatetosum* sites were confirmed.

2958. SPURR, S. H. The management of Douglas Fir in New Zealand. *Suppl. to Newslett. N.Z. For. Serv.* 10 (10), 1960. pp. 12.

An address given to the Rotorua Section of the N.Z. Institute of Foresters, and dealing mainly with increment.

2959. SERRANO VICENS, R. Datos sobre algunas experiencias realizadas en el "Monte de Solana".

[Some experiments undertaken in the Solana Forest.] *Montes, Madrid* 16 (96), 1960 (577-9). [Span.]

The Solana Forest is situated in the province of Guadalajara between 860 and 1000 m. alt., and is composed largely of *Quercus ilex* (managed as coppice), and some *Pinus* spp. In collaboration with the meteorological station situated in this forest, 62 forest species and varieties [no data given on age of transplants, spacing, length of observations etc.] were tested, and tabulated results are presented showing for each species the type of transplant (ball planted or bare rooted), rainfall in July-Aug. of the first year, failures in the first year and subsequent failures, minimum temperature and minimum annual rainfall supported, mean temperatures of the hottest and coldest months, and general development of the plants. Preliminary results show that *Abies pectinata*, *A. pinsapo* and *A. grandis* survived intense drought under the shade of the Pines; late frost caused serious injury to Lime, Poplar, Ash and *Q. serrata*; Beech showed greater resistance to summer heat than *Q. robur* and *Q. sessiliflora*; *Q. borealis* finally succumbed to intense heat; direct sowing of acorns failed completely because of depredations by rodents, and no effective protective measures were found; Bamboo and some specimens of *Pinus canariensis* surprisingly resisted minimum temperatures of -14°C . and a February mean of -1.1° .

2960. RANNERT, H., and MINELLI, H. Gedeihen und Wuchsleistung einiger Versuchsbestände mit fremdländischen Holzarten im Burgenland. II. Teil: Roteiche und Schwarznuss. [Growth of some trial plantings of exotics in the Burgenland. II. *Quercus borealis* and *Juglans nigra*.] *Allg. Forstztg.* 71 (23/24), 1960 (266-8). 6 refs. [G.g.]

Includes some yield data on two plots in stands of *Q. borealis* var. *maxima* aged 30 and 36 years, and one in a *J. nigra* stand aged 32 years. Both species showed little or no injury of any kind.

2961. RHEINHEIMER, G. Beobachtungen über die Anzuchtmöglichkeiten von drei *Nothofagus*-Arten aus Chile in Norddeutschland. [The possibility of growing three *Nothofagus* spp. from Chile in N. Germany.] *Forstarchiv* 32 (1), 1961 (8-11). 9 refs. [G.g.]

Trials of (a) *N. dombeyi*, (b) *N. procera*, and (c) *N. obliqua* were started at Reinbek in 1956, using seed from S. Chile. Data on germination, survival, and growth are presented. In the greenhouse, all 3 species did well, but in the field only (b) and (c) were successful. No seedlings of the evergreen (a) lived longer than the first winter, and the leading shoots of (b) and (c) suffered frost damage of varying severity. Nevertheless, (c) showed very considerable height growth. In 1960, the growing period lasted from the beginning of May to the end of August for (b) and the beginning of October, with a 4-week break in the summer, for (c). Further tests of sites, provenances, etc. are recommended, particularly with (c). [Cf. *F.A.* 17 No. 205.]

2962. KHAN, M. I.-UR-R. A note on exotic *Acacia* spp. introduced into West Pakistan. *Pakistan J. For.* 10 (3), 1960 (213-7). 7 refs.

Short notes on trials of a number of African, American, and Australian species.

2963. Blackwood (*Acacia melanoxylon*). Furniture Manufacture & Timber Industries, South Africa 2 (8), 1960 (19). From abstr. in *Tech. Bull. Furniture Developm. Coun.* 9 (47), 1960 (No. A536). P.R.

Details of the successful planting in S. Africa of this Australian species, its durability, and mechanical, physical and machining properties.

2964. BRANCA, A. Primi risultati sperimentali sull'introduzione di essenze forestali in Somalia. Periodo 1954-1958. [First experimental results of the introduction of forest tree species into Italian Somaliland, 1954-8.] *Riv. Agric. subtrop. trop.*, Firenze 54 (4/6-7/9), 1960 (652-60). [It.] E.M.B.

Short notes on *Acacia* spp., *Caesalpinia tinctoria*, *Ceratonia siliqua*, *Erythrina indica*, *Eucalyptus* spp., *Grevillea robusta*, *Jacaranda mimosaeifolia*, *Swietenia mahagoni*, and *Tectona grandis*.

2965. MONJAUZE, A. Note on the development of Eucalypts in certain arboreetums in cold, semi-arid Oran. New Zealand Forest Service, Wellington. 1960. pp. 9. Transl. from *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord, Alger* 49, 1958 (143-60). Limited distribution.

A translated version of a paper substantially similar to one already reported [see *F.A.* 20 No. 1680].

2966. METCALF, W., and PALLEY, M. N. The *Eucalyptus* grove on the Berkeley Campus of the University of California. *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 23, 1960. pp. 3. 2 refs.

Gives an account of this plantation of *E. globulus*, believed to have been planted ca. 1884. Mean d.b.h. increased from 20 in. in 1917 to 28.9 in 1957, and stand b.a. from 344 to 505 sq. ft.

2967. PICKFORD, G. D., and LEBARRON, R. K. A study of forest plantations for timber production on the island of Hawaii. *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 52, 1960. pp. 17. 2 refs.

A study of the growth of 4 important introduced species, (a) *Eucalyptus robusta*, (b) *E. saligna*, (c) *Fraxinus uhdei*, and (d) *Toona ciliata* var. *australis*. The data were based on 76 $\frac{1}{16}$ -acre plots in 39 stands aged 21-38 years, and include details of stocking, mortality and cull, and relation of growth to habitat (altitude, rainfall, soils, and drainage). M.a.i. and maximum annual increment (both in bd. ft./acre), mean height of dominants in the tallest stands, and annual height growth were for (a) 1800, 3400, 179 ft. at 38 years, and 2.5-6.5 ft. respectively; for (b) 2100, 3800, 172 ft. at 21 years, and 4.0-8.2 ft.; for (c) 500, 1200, 109 ft. at 30 years and 2.0-3.6 ft.; for (d) 600, 1200, 121 ft. at 25 years, and 2.0-4.8 ft. Stands are generally thrifty. Some large persistent branches were noted on (a); much of (c) and (d) had short boles and forked multiple stems. These could be reduced by silvicultural or genetic means. The yields indicate very favourable potentialities for commercial timber production in Hawaii. [Cf. *F.A.* 15 No. 2802; 21 No. 5192.]

2968. Cozzo, D. Resultados de las plantaciones forestales con *Hovenia dulcis* en la región argentina subtropical y húmeda de Misiones. [Results of forest plantations of *H. dulcis* in the Argentinian moist, subtropical region of Misiones.] *Rev. for. argent.* 4 (4), 1960 (107-17). 5 refs. [Span.]

Discusses the introduction into Misiones of *H. dulcis*, giving information on the climate of this region, the ecological requirements of the tree, and the properties and uses of the wood. The species is adaptable, growing well on unfavourable sites. Its early growth is particularly rapid. Growth data are presented from 9 different plantations in Misiones. Up to the 10th year it can produce, on good sites, a mean annual increment of 20 cu. m., and on poor sites 15-17 cu. m./ha. It is resistant to leaf-cutter ants, and competes well with rival vegetation, though the latter may retard growth [cf. *F.A.* 16 No. 2770]. The tree coppices well and is particularly suitable for fuel-wood. It is best managed as coppice with a felling cycle of >10 years. Thinnings are necessary only when it is making very rapid growth on good sites. It coppices best when cut in late winter or early spring. On sites liable to flooding, stumps <30 cm. high should be left.

2969. LARREA QUIRICI, I. A., and MORENA, J. A. Las plantaciones forestales de Parque de Vacaciones para Funcionarios de la U.T.E. [Forest plantations in the Holiday Park for Employees of the State Telephone and Workshops Services.] *Silvicultura, Uruguay* No. 12, 1959 (5-38). 11 refs. [Span.e.]

This park, which is situated to the east of Minas, contains extensive plantations, mainly of Eucalypts and Pines, but also of *Cupressus* spp., *Acacia* spp., *Populus* spp., *Salix* spp., and others. Information is presented on the soils, topography, natural vegetation and climate of the area, with some preliminary data on the height and diameter growth of the main species.

232.12. Races and Provenance Trials

See also Nos. 2771, 2931, 3056.

2970. KRAMER, H. Rationelle Stichprobenaufnahme bei Versuchsfeldern in Jungbeständen. [Suitable sampling methods for trial plots in young stands.] *Allg. Forst- u. Jagdztg.* 131 (12), 1960 (280-7). 9 refs. [G.g.e.]

Various methods were compared against full enumeration data for heights (in 10-cm. classes) of Larch in 6 provenance trial plots established at Kattenbühl in 1954 or 1956 at 625 plants per plot. With a variation ranging from 250 cm. to 170 cm. per plot, standard deviation and mean sampling error agreed sufficiently well with values computed from the enumeration data to serve as a basis for determining sampling density; 100 plants/plot were sufficient for a $\pm 5\%$ confidence interval at $P < 0.05$. With systematic sampling (preferred as more likely to reveal systematic influences of the site) there was no difference in accuracy between taking whole rows or sampling every 2nd, 4th etc. tree in a larger number of rows.

2971. MOCANU, V., and RUBȚOV, Ș. Plantații experimentale cu diferite specii și varietăți de larice. [Trials of different species and varieties of Larch.] *Rev. Pădurilor* 75 (9), 1960 (528-33). [Rum.russ. g.f.e.]

Tabulates and discusses data from trials, in different parts of Rumania, of *Larix sibirica* and *L. decidua* of 3 different provenances (Sudeten, Alpine, and an acclimatized race originally of Austrian provenance).

2972. DIETRICHSON, J. Bruker vi mellomeuropeiske provenienser riktig. [Are central European provenances being used correctly in Norway?] *Norsk Skogbr.* 7 (2), 1961 (67-70). 4 refs. [Nor.]

Discusses the resistance of various provenances to autumn frosts and summarizes briefly studies on the date of completion of growth of Pine trees, 2 + 0 and 2 + 1 Spruce, Douglas Fir, Sitka Spruce and Western Hemlock. Results show that provenances from the Harz mountains and from 800-1000 ft. alt. in Austria are more likely to be susceptible to frost than those from Norway and from altitudes >1100 ft. in Austria. Douglas Fir provenances from Oregon and Washington continued growth later than a low-level provenance from Vancouver Island. Sitka Spruce and Western Hemlock from Norwegian seed stopped growth early.

2973. GATHY, P. L'origine des graines d'épicéa commun (*Picea abies* Karst.). [The source of Spruce (*P. abies*) seed.] *Bull. Soc. For. Belg.* 67 (11), 1960 (381-94). 15 refs. [F.f.]

[Cf. *F.A.* 22 No. 388.] Reports on the Belgian Spruce provenance trials.

2974. DEER, H. J., and ENGHARDT, H. Is geographic seed source of Slash Pine important? *Sth. Lumberm.* 201 (2513), 1960 (95-6).

In a 22-year provenance trial at Alexandria, La., no significant differences were found in stand density, volume, diameter, height, wood sp. gr., tracheid length or susceptibility to fusiform rust, between 7 seed sources from Georgia, Louisiana, Mississippi, Florida and S. Carolina.

2975. GIORDANO, E. Osservazioni sullo sviluppo dei semenzali di nove provenienze di pino marittimo. [The development of seedlings from nine provenances of *Pinus pinaster*.] *Cellulosa e Carta* 11 (10), 1960 (5-7). 5 refs. [It.f.e.g.]

Gives tabulated data on monthly precipitation at the stations from which seed was collected (in France, Spain, Italy, and Morocco), frequency distribution of seedling height 8 months after sowing, and statistical significance of differences in mean height. The experiments, carried out at Rome, indicate a difference in behaviour between the Mediterranean and Atlantic (Gironde and Morocco) provenances.

2976. SLUDER, E. R. Early results from a geographical seed source study of Yellow Poplar [*Liriodendron tulipifera*]. *Res. Note Stheast. For. Exp. Sta.* No. 150, 1960. pp. 2.

After 5 years in a plantation near Asheville, N.C., local seedlings were among the best for survival but

mean total height growth did not differ significantly between the 16 provenances under trial. Commencement of growth was correlated with length of growing season, date of last killing frost, and latitude of the place of origin; cessation of growth with the first killing frost in autumn.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.3/7.

2977. MILETIĆ, Š. Italijanski klonovi topola na području L.Š.G. "Košutnjak"—Bilje. [Italian clones of Poplar in the region of the "Košutnjak" game and forest estate at Bilje [Croatia].] *Topola, Beograd 4* (13/14), 1960 (14-6). 1 ref. [Serb.f.]

Describes the introduction and performance of Italian clones in Jugoslavia since 1956. Clones 214 and CBD (Cartiere Beniamino Donzelli) are considered particularly suitable for large-scale use, as they are resistant to disease and grow faster than native species.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 2875, 2947, 3042, 3044, 3248.

2978. INDANS, R. JU., and BRIEDIS, V. JA. Ručnoj motorizovannyj instrument dlja podgotovki počvy pod lesnye kul'tury. [A powered hand-tool for preparing the soil for plantations.] *Trud. Inst. Leshoz. Probl., Riga* No. 18, 1960 (143-56). 4 refs. [Russ.] N.L.L.

A general account of a mobile soil scarifier, a portable hole-borer, and a portable hole-borer-cum-soil-scarifier, all of which have been developed in Latvia and are powered by the engine of the Družba power saw.

2979. VAN [WANG], C.-L. Rost i razvitie lesnyh kul'tur v pervye gody žizni v zavisimosti ot sposobov podgotovki počvy v Leninskom leshoze Krymskoj oblasti. [Early growth and development of plantations in relation to the methods of soil preparation, in the Lenin leshoz, Crimea.] *Lesn. Ž., Arhangel'sk 3* (2), 1960 (30-4). [Russ.]

A fuller account of work already noted [see F.A. 21 No. 1675].

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also Nos. 2879, 3016-7.

232.311. Seed Production (Seed-Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 2880, 3035.

2980. KOLPIKOV, O. M. K voprosu ob urožajah i kačestve semjan listvennyj Lindulovskoj rošč. [Seed crops and seed quality of *Larix sukaczewii* in the Lindulovo stand.] *Bot. Ž.* 45 (5), 1960 (730-2). 6 refs. [Russ.]

[Cf. F.A. 21 No. 1584.] Investigations have shown that in some years abundant seed is produced, and that its germination is 20-25%. Sprinkling mineral

soil over the seeds improves conditions for germination. The transplanting of 1- to 2-year-old wildlings to the nursery is approved where it saves the labour of collecting cones from very tall trees.

2981. AZNIEV, JU. N. Plodonošenie sosny obyknovnoj v perestojnyh nasaždenijah Belovežskoj pušči. [The fruiting of Scots Pine in over-mature stands of the Belovežskaja Pušča reserve.] *Lesn. Ž., Arhangel'sk 3* (2), 1960 (161-3). 7 refs. [Russ.]

Tabulates data on the numbers of cones and quality of seeds produced by Pines 100, 130, 170, 210 and 240 years old in the *Pinetum vacciniosum*, site class I, in Belorussia. There was a clear tendency for cone yields per tree to increase with age, up to and including the age of 240; seed quality was high for all the ages studied.

2982. ROY, D. F. Douglas-Fir seed production and dispersal in northwestern California. *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 49, 1960. pp. 22. 10 refs.

A detailed report on a study in 4 localities in 1951-58, presenting data obtained annually by counting and examining seeds caught in seed traps in clear-felled blocks and under the canopy of old-growth timber. It was found that seed production is variable from year to year and may be inadequate for several successive years. Seed crops were generally poor in quality. Over the 8 years, almost 42,000 seeds were caught in the traps, of which only 18% were sound. The bumper seed-year of 1956 gave a total catch of 20,620 seeds, of which 23% was sound. Of the unsound seed, 4% was damaged by insects, 6% was aborted, and 67% empty. The large % of empty seed may be associated with incomplete pollination. The amount of seed dispersed decreased rapidly with increasing distance from the seed source; in the centre of clear-felled blocks (5-6 chains from the trees), seed fall varied from 0 to 16%, with a mean of 10%, of that under trees adjacent to the clearing. To ensure natural regeneration on clear-felled blocks, a maximum width of 8 chains is recommended. [Cf. F.A. 20 No. 1564.]

2983. HOLMSGAARD, E., and OLSEN, H. C. Vejrets indflydelse på bogens frugtsætning. [The effect of weather on the production of Beech mast.] *Forstl. Forsøgsv. Danm.* 26 (3), 1960 (345-70). 16 refs. [Dan.dan.e.e.]

The production of mast in 1846-1955 was classified into 4 groups ranging from failure to very good and the results were compared with data for rainfall and temperature for the same period. Correlations were found between a good crop and high temperature and low rainfall in June and July of the preceding year. The correlation found by Matthews [see F.A. 17 No. 1353] between mast production and sunshine was shown not to be a true correlation but to be caused by the close relation between sunshine and temperature. Heavy rainfall in the April of the mast year appears to reduce mast production. Heavy mast production in one year reduces production in the following year.

2984. LIPPOCZY, B. Milyen hatással van a csapadék mennyisége a makktermésre? [Influence of the amount of rainfall on Oak mast production.] *Erdő* 8 (4), 1959 (149-50 + smries. in suppl.). [Hu.russ.g.]

A definite connexion has been established between mast production and amount of rain in the mast year. Irrigation also stimulated mast production.

2985. VOLKOV, F. I. Nekotorye dannye o vlijanii izreživaniya drevostoev i ryhleniya počvy na plodonošenie duba. [Some data on the influence of thinning and soil cultivation on the fruiting of Oak.] *Soobšč. Inst. Les.* No. 8, 1957 (3-12). 13 refs. [Russ.russ.]

Experiments in medium-aged upland Oak stands of site class I-II in the Tellerman forest show that the best density is 0.6 (or at least, in the range 0.5-0.7), and that a small % of associate species is desirable, but not Birch and Aspen, which compete seriously for water and intercept the Oak pollen. Soil cultivation and clearing of debris and undergrowth further increase acorn yields and facilitate collection.

2986. PEDERICK, L. A. Some seed collection data from adjacent trees of *Eucalyptus obliqua* L'Her. *For. tech. Pap. For. Comm. Vict.* No. 5, 1960 (19-24). 1 ref.

[Cf. F.A. 20 No. 4430.] To study some seed production characteristics of *E. obliqua*, seed capsules were intensively sampled in Feb. 1959 on a 3-acre site at 2000-ft. alt. The collection was made from felled 60-year trees, the majority of the capsules being of 1958 flowering. Considerable variations in seed production from tree to tree, and in quality and quantity from year to year calculated on remnants of the 1956 and 1957 crops, were observed. Brief reference is made to the effect of insect parasites on seed production, but no definite conclusions are drawn.

2987. MÁTYÁS, V. Magtermelő állományaink célja értelme és kezelése. [The definition, importance, and treatment of accepted seed stands.] *Erdő* 9 (5), 1960 (183-91 + smries. in suppl.). [Hu.russ.g.]

[Cf. F.A. 21 No. 378.] County maps show the distribution of Pine, Oak, Beech, Robinia and Poplar seed stands, 5, 10, 50 and 100 ha. in area, that have been demarcated and maintained for several years. The treatment most proper to their purpose is the selection system, for conversion to which all tending should be adapted.

2988. BABOS, I. A homoki értékakáról. [The so-called precious type of the Black Locust (*Robinia pseudoacacia* L.) on sandy soils.] *Erdő* 7 (8), 1958 (211-7). [Hu.] From *abstr. in Hung. agric. Rev.* 7 (4), 1958 (9). [E.] C.G.B.

Adds to the observations of L. Szönyi further notes on the type's superiority in growth and in numbers according to site quality, its ability to escape forking by completing terminal growth earlier, and its probable origin, resulting from inherited characteristics and favourable sites.

2989. Tree breeding—Slash Pine [*Pinus elliottii*]. *Extr. from Rep. Qd. For. Serv.* 1959/60, 1960 (16).

A series of observations were made in 1959 and 1960 on the phenology of flowering of the elite trees being used in seed-orchard establishment. The following points were established: (1) On a Slash Pine tree anthesis and receptivity generally overlap in time. (2) There is wide variation between trees in commencement and duration of flowering, so that natural crosses of some parents could not occur. (3) Flower development in a clone corresponds generally with that in the parent tree, but there is variation between ramets, perhaps due to minor site differences, to taking of grafting material from different crown levels in the parent, or to rootstock influence.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also No. 2884.

2990. SÖDERSTEN, K.-E., and ÖSTERBERG, S. Om betydelsen av minimilängdbestämmelser vid insamling av talkott. [The effect of minimum length regulations in Pine cone collection.] *Norrlands SkogsvFörb. Tidskr.* 1960 (4), (343-58). 9 refs. [Sw.]

Cone material collected from 19 areas throughout the greater part of Sweden was analysed. Results are given in graphs showing: mean number of cones per litre for different cone length classes; the % of smaller cones (< 35, 30 and 25 mm. long respectively) for different numbers of cones per litre; and yield of extracted seed per cone and per volume unit, 1000-seed weight and plant weight after 10 days' growth, germination % and yield of viable seed for the different length classes. It is concluded that, although allowing cones of smaller lengths increases costs [cf. F.A. 21 No. 3008], this is less important than the increased yield of usable seed.

2991. CHURCH, T. W., and SUCCOFF, E. I. Virginia Pine seed viable two months before natural cone opening. *For. Res. Note Ntheast. For. Exp. Sta.* No. 102, 1960. pp. 4. 4 refs.

Studies in Maryland showed that Virginia Pine cones could be collected as much as 9 weeks before normal opening in late October, with assurance of moderate to good seed viability. Seed collected from trees that had been felled for 1-4 weeks was as viable as seed collected on the day of felling.

2992. SWOFFORD, T. F. The effect of air drying of cones upon seed germination. *Tree Plant. Notes* No. 43, 1960 (3-4). 2 refs.

Cones were collected from *Pinus elliottii*, *P. taeda* and *P. palustris* in Florida, and in each case half of the cones (a) collected from each tree were placed in the usual well ventilated but unheated drying sheds, and half (b) were sent to the Tree Seed Testing Laboratory at Macon, Ga., and placed in wire baskets in an air-conditioned room maintained at 72° C. Cones in lot (b) opened in 4 days and the seeds were immediately tested for germination; cones in lot (a) had opened at the end of 6 weeks and the seed was sent to the laboratory for testing. Germination % of *P. elliottii* was not significantly

different in (a) and (b), but in *P. taeda* and *P. palustris* it was considerably higher in (b) (90 and 67 respectively vs. 71 and 57).

2993. MARJAI, Z. A nyármag gépi szikkasztása. [The mechanical drying of Poplar seed.] *Erdő* 8 (3), 1959 (94-7 + smries. in suppl.). [Hu.russ.g.]

It was found that keeping properties improved and germination was relatively higher (70-80%) if the moisture content of seed was held at 5-8%. After a pilot trial with a hair-drier playing through a drum, a larger-scale operation showed that a fan blowing through a cylinder 20 cm. long $\times$ 50 cm. wide could dry 10 kg. of seed in 8 hours.

2994. DUFFIELD, J. W. A simple device for weight-sorting seeds. *For. Sci.* 6 (4), 1960 (362). 4 refs.

In the device illustrated, a glass-fibre arm, drawn out from a 5-mm. tube, is adjusted for an end deflection of 1.5 mm./mg. The arm carries a pan and near it an aluminium vane between 2 magnets to damp its movement, a range of 0-20 mm. being convenient for Douglas Fir seed. An adjustable sloping ramp carrying an unloading comb with horizontal teeth set at intervals corresponding to a 1.5-mm. deflection (and 1 mg. weight) is moved under the pan until a tooth tips the seed (total automatically counted) into the appropriate compartment. The seed is loaded by hand forceps and sorted at 1000/hour, a rate that could easily be increased by substituting a rotary type of comb.

2995. DUNIN, L. M. Mechanizirovannaja sortirovka želudej po udel'nomu vesu. [Mechanized grading of acorns by specific gravity.] *Lesn. Hoz.* 12 (6), 1960 (57-9). [Russ.]

Describes and illustrates a grading machine employing a tank to hold fluids of various gravities, and also a unit for applying fungicides and/or insecticides to the acorns. Acorns were divided into three lots with sp. gr. (a) <1, (b) 1-1.1, and (c) >1.1. The 1000-seed weight was (a) 3017 g., (b) 3931 g., and (c) 4180 g. Field germination % was only 4 in (a), 38 in (b), and 88.5 in (c); the seedlings from (c) were much the sturdiest.

232.315. Seed Storage and Treatment

See also Nos. 3009, 3017, 3026, 3215.

2996. TUMBARELLO, G. Ricerche preliminari sulla conservazione del seme di abete bianco. [The storage of *Abies alba* seed.] *Ital. for. mont.* 15 (5), 1960 (176-82). 8 refs. [It.f.]

Experiments have been made at the Forestry Institute of Florence University on seed stored for 15 months at temperatures varying from 0 to 5° C. Seed kept in a single layer, 10-15 cm. deep, on wire-mesh trays, showed a reduction of only 5% in germinative capacity, whereas seed stored in hermetically sealed containers suffered considerable reductions even when moisture content was near the optimum. If seed is to be stored satisfactorily in hermetically sealed containers, temperatures must be maintained below 0° C. and the m.c. of the seed must be kept constant so that its weight is 300-320 g./litre.

2997. VINCENT, G. Skladování semen jehličanů v uzavřených lahvích. [Storing conifer [*Picea abies*, *Larix decidua*, *Pinus sylvestris*] seed in sealed bottles.] *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (8), 1959 (803-20). 39 refs. [Cz.cz.russ.g.]

The paper consists of three parts: (I) reviews and assesses work dating from F. Haberlandt's experiments on grain storage in earth-covered containers and sealed bottles, continued by G. Wilhelm (1884), with seeds stored in airtight containers and dried at high temperatures, to recent work [see *F.A.* 14 No. 2124; 18 Nos. 1492, 2746]. (II) Evaluates results of experiments begun in 1952 on Pine, Larch and Spruce seed stored in sealed bottles [see *F.A.* 20 No. 4434] and kept at 4° C., normal temperature variations during the storage period (1952-55) being $\pm 2^\circ$; in 1956-57 the seed was stored in a cellar where temperature ranged from 2-8° in winter to 8-16° in summer. Sample analyses were made annually from each bottle. (III) Examines the moisture variations of seed stored in relatively dry and humid conditions. To determine the m.c. of the seed, samples were analysed directly after being dried for 48 hours at 30° and again after 10 days' storage under dry or humid conditions. Highest germinative capacity was obtained for seed stored at a constant temperature and r.h., and storage in corked bottles at varying temperatures was far less effective than storage in sealed bottles at 4° $\pm$ 2°. Instructions are given on the storage of seed of low m.c.

2998. CONEV, V. A. Proučavaniya vārhu kačestvata i vārhu zimnoto zapazvane na mestni posevni material ot pitomen kesten. [Studies on the quality and winter storage of Bulgarian *Castanea sativa* fruits.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (75-88). 14 refs. [Bulg.f.]

Studies on 402 kg. of fruits from three harvests and various parts of the country showed that Bulgarian Chestnuts had a germination % of 70, and equalled foreign fruits in size and weight. Winter storage for spring sowing is best done by placing the fruits in boxes or on shelves, covering a layer of fruits 4-5 cm. deep with a layer of dry Oak leaves 8-10 cm. deep, and keeping them at 0° C.

2999. ZAHARIEV, B. J., CONEV, V. A., and BOŽINOV, B. B. Udoben metod za zapazvane na dābovi žālādi v suha sreda. [A suitable method of storing acorns in a dry medium.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (53-74). 4 refs. [Bulg.g.]

Reports further trials, in 1956-59, with acorns of a number of *Quercus* species [cf. *F.A.* 20 No. 398]. Results indicated that the germinative capacity could be maintained during 6 months' storage, and that it was possible to store large lots of acorns in wooden troughs 1 m. wide, 30 cm. deep and of any length, the acorns being placed in a layer ca. 15 cm. deep between two layers of dry Oak leaves ca. 10 cm. deep. Acorns harvested from mid-October onwards kept better because their m.c. was lower. Acorns of *Q. cerris* had a germination % of 90 in the spring after storage; for *Q. robur* it was 80-90%, and for *Q. rubra* 70-80%. *Q. sessiliflora* acorns also kept

well, but *Q. conferta* did not. The method is thought to be suitable for most if not all parts of Bulgaria.

3000. GAMMAGE, J. L., and MAISENHEDER, L. C. Refrigeration prolongs viability of Cottonwood [*Populus deltoides*?] seed. *Tree Plant. Notes* No. 43, 1960 (5-6).

Seed was stored (a) in a refrigerator at 40° F., (b) in nylon-mesh bags indoors at ca. 75° and (c) as (b) but hung in the shade of a Cottonwood tree. The seed had been collected in July from partially opened catkins. Germination was tested daily for 25 days. Seed in lot (c) deteriorated rapidly, germinating poorly after <1 week of storage; (b) maintained viability for ca. 1 week; (a) maintained viability for 3-5 weeks.

3001. PÓLYA, L. Injury by soaking of *Populus alba* seeds. *Nature, Lond.* 189 (4759), 1961 (159-60). 4 refs.

When air-dried seeds stored in closed vessels at +5° C. were soaked for 15, 35, and 60 min. in distilled or tap water, the % of abnormal seedlings was 40.2, 40.0, and 45.9 vs. 11.8 in controls. The % of seeds not germinating also rose slightly.

3002. NORD, E. C., and ATTA, G. R. VAN. Saponin—a seed germination inhibitor. *For. Sci* 6 (4), 1960 (350-3). 9 refs.

About 300 of the 444 species of the U.S. Forest Service Seed Manual [see *F.A.* 11 No. 2655] show delayed germination (ascribed in some cases to impervious seed-coats). Soaking the seeds of *Atriplex canescens* and *Purshia tridentata* in water and in 5, 1, and 0.1% saponin solution indicates that the water absorbed by the seed-coats reduces the inhibitory saponins occurring in them, to concentrations that not only allow of, but may even stimulate, germination.

3003. GOO, M., and TUSHIASI, H. [Hastening the germination of *Pinus densiflora* seeds by gibberellin.] *J. Jap. For. Soc.* 40 (12), 1958 (509-11). [Jap.jap.e.e.]

The results of the investigation [tabulated in English] show that germination may be accelerated by soaking the seeds in a 1000 p.p.m. gibberellin solution for several days at 1° C. before placing them in the seedbed without gibberellin.

3004. KOZŁOWSKI, T. T. Effect of moist stratification and storage in polyethylene bags on germination of forest tree seed. *For. Res. Note Wis. Coll. Agric.* No. 59, 1960. pp. 3 + 1 tbl. 1 ref.

Replicated germination tests on seeds of 6 species difficult to germinate were made after giving the following treatments: (a) 10 weeks' storage in closed polythene bays at 5° C. after soaking in a fungicide (Arasan) solution for 16 hr.; (b) 10 weeks' stratification in moist vermiculite at 5°; (c) controls, stored dry at 5°. Both (a) and (b) generally stimulated early germination, (b) being significantly better than (a) for *Abies balsamea* and *Rosa multiflora japonica*, while (a) was better than (b) for *Picea glauca*. No germination was recorded for *Viburnum trilobum* with any treatment. Both (a) and (b)

hastened germination of *Celtis occidentalis* and *Viburnum lantana*, but germination was unsatisfactory even with treatment. In general, the experiment emphasized that stratification is a better promoter of germination in dormant seeds than polythene storage, though the latter method is useful with some species where ease of handling is important.

3005. DUDIĆ, M. Stimulisanje rastenja ponika crnog bora izazvano jonizujućim zračenjem semena. [Stimulation of growth of young *Pinus nigra* seedlings resulting from exposing seeds to ionizing radiation.] *Šumarstvo* 13 (7/8), 1960 (375-82). 6 refs. [Serb.e.e.]

Seed from 4 trees selected for their good form and/or resin-producing capacity in the Crni Vrh area, near Priboj-on-Lim, was exposed to radiation from a Co⁶⁰ source at doses of 100, 300, 500, and 1000 r.e.p. In nursery trials, seedlings from seed treated when dry were 1.6-33.8% taller after one year than untreated controls. Varying doses affected the progeny of each tree in different ways. Treatment of the seed after soaking for 24, 48, and 72 hours again showed different responses from each tree. Laboratory tests on germination and weekly seedling growth, using further seed samples treated similarly, confirmed that the stimulating effect of radiation was dependent on many factors, including dose, length of soaking, and parent characteristics.

3006. VIDA KOVIĆ, M. Utjecaj gama-zraka na klijavost sjemena nekih konifera. [The effect of gamma-rays on the germinative capacity of the seeds of certain conifers.] *Šum. List* 84 (7/8), 1960 (235-44). 13 refs. [Croat.croat.e.]

Seeds of (a) *Pinus sylvestris*, (b) *P. nigra*, and (c) *Picea abies* were exposed to 32 different dosages from 82 to 20,000 r units from a Co⁶⁰ source. Seed of (a) and (c) was one year old, of (b) 3 years old. The % germination (as tested on samples of 300 seeds for each dosage, with controls of 600 seeds) is recorded, with the mean number of days taken to germinate over a period of 40 days, and the standard deviation. Irradiation in small doses was found to increase germination. Thus germination of (a) exposed to dosages of 82 to 2500 r was greater than that of controls, reaching 96.3% vs. 84.8. In (b), germination was greater than controls at 748 to 3500 r, reaching 49% at 3000 r vs. 42.6, and in (c) at 500-5500 r, reaching 89.3% at 4000 r vs. 84.3. Mean time taken to germinate increased with increased dosages. The number of seeds germinating daily is shown in graphs. In (a), the highest dosage that permitted any germination (0.6%) was 14,000 r, whereas (b) and (c) showed germination of 12.3 and 28.6% respectively at the maximum 20,000 r. [Cf. *F.A.* 20 Nos. 3075-6.]

3006A. JOVANOVIĆ, B., and TUCOVIĆ, A. Zapažanja o dejstvu jonizujućeg zračenja na seme nekih eurameričkih topola. Prethodno saopštenje. [The effect of ionizing radiation on the seeds of some Euramerican Poplars. Preliminary report.] *Rad. Istraž. Topola Jugosl. Nac. Kom. Topola* No. 1, 1960 (59-87). 7 refs. [Serb.f.]

Describes in detail the first-year results of tests on seeds from crossings of *Populus* × *regenerata*, *P.* × *marilandica*, and *P.* × *gelrica* with *P.* × *serotina* in May 1958 at Belgrade. Other results are reported elsewhere [cf. *F.A.* 22 No. 417]. Samples of 1000 seeds from each hybrid were exposed to doses of 500–50,000 r from a Co⁶⁰ source; *P. gelrica* × *P. serotina* samples also received doses of 70,000, 90,000, and 120,000 r. Doses ≤50,000 r had little effect on germination %, though with doses >50,000 r this was slightly lower and germinative energy was much reduced. After 40 days, seedlings from seed treated with 500 and 1000 r were taller than controls, but with increase in dose to 10,000 r growth above ground was reduced. Doses >10,000 r gave distinctly retarded growth. After 2 months, treatment with 500 and 1000 r still gave increased growth. Doses >10,000 r reduced height growth and number and size of leaves. Of 3000 plants from seed treated with >50,000 r, none survived. At the end of the growing season, seedlings from the 1000 and then the 500 r treatment were tallest. An isolated stimulating effect was noted at 8000 r. The reduction in growth with higher doses continued. The 17,527 surviving plants (from 52,000 seeds, including controls) are being grown on for further study.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 2980, 3017.

3007. JONES, L. Rapid moisture determination of tree seed with an electronic meter. *Tree Plant. Notes* No. 43, 1960 (7).

The Region 8 Tree Seed Testing Laboratory, Macon, Ga., has been successfully using a Radson Electronic Meter Model 20, originally developed for testing agricultural seed, for use with which calibration conversion charts have been prepared for the principal Southern Pine species.

3008. SCHREIBER, and STEPHAN, W. Über die Schnellbestimmung der Feuchte des forstlichen Saatgutes. [Rapid determination of forest seed moisture content.] *Forst u. Jagd* 11 (2), 1961 (58–60). [G.]

Describes an E. German battery-operated portable electric moisture meter for seed, with a special handmill for grinding the seed before measuring its m.c., and separate conversion tables for converting the indicator readings into m.c. for light and heavy hardwood seed, conifer seed, and cones.

3009. SHEARER, R. C., and TACKLE, D. Effect of hydrogen peroxide on germination in three western conifers. *Res. Note Intermt. For. Range Exp. Sta.* No. 80, 1960. pp. 4.

Seed of *Larix occidentalis*, *Pseudotsuga taxifolia* var. *glauca* and *Abies lasiocarpa* germinate very slowly in standard germination tests without pretreatment. A simple technique is described, using H₂O₂ instead of water as the wetting agent, which hastens germination and shortens the test period. Results are given on greenhouse tests on the three species.

3010. CAPPELLI, M. Un metodo semplice per elevare il valore culturale del seme di pino maritimo. [A simple method of improving the quality of *Pinus pinaster* seed.] *Ital. for. mont.* 15 (5), 1960 (173–5). 1 ref. [It.f.]

Germination and cutting tests were made on seed that floated when immersed in water. From 20 samples, the following results were obtained. (1) The % of floating seed capable of germinating was always low (average ca. 5%); of the remaining 95%, most was empty or damaged (64 and 30% respectively). In the cutting test, 63% of the floating seeds were found to be empty, 17% damaged, and ca. 19% apparently sound.

3011. ČABRAJIĆ, T. Prilog poznavanju procesa klijanja sjemena crnog bora (*Pinus nigra* Arn.). [Germination of *P. nigra* seed.] *Nar. Šumar, Sarajevo* 14 (1/2), 1960 (68–70). 4 refs. [Croat.]

In tests on 24 samples, each of 100 *P. nigra* seeds, placed on filter paper at 20° C., 12 in (a) light and 12 in (b) dark, mean germination % and number of days until germination were 80 and 8.5 respectively for (a) vs. 76 and 12.7 for (b).

3012. ČABRAJIĆ, T. Neke osobine sjemena crnog bora. [Some characteristics of *Pinus nigra* seed.] *Nar. Šumar, Sarajevo* 14 (3/4), 1960 (141–4). 4 refs. [Croat.g.]

In a study on *P. nigra* cones and seed from Trebinje, S. Bosnia and Herzegovina, a comparison of seed dimensions, weight, quantity per cone, % healthy seed, germination, etc., showed that seed from closed stands was superior in quality to that from isolated trees.

3013. SANESI, G. Indagine su due metodi rapidi per la determinazione della germinabilità delle ghiande. [Two rapid methods of determining the germinability of acorns.] *Ital. for. mont.* 15 (5), 1960 (190–2). 5 refs. [It.f.]

Experiments were made on 6600 acorns belonging to several species of Oak [*Quercus robur*, *Q. ilex*, *Q. cerris*, *Q. sessiliflora*, and *Q. borealis*], using two germination tests: (a) removal of the pericarp, soaking in water for 18 hr., and germination in sand at 24° C.; (b) soaking in water for 48 hr., removal of the lower third of the acorn and the whole pericarp, and germination on sand at 20° (for *Q. borealis* 20–30°). The tests were completed in 28 days, method (a) being slightly the more rapid; both were much quicker than the control (germination of intact acorns in sand at 20°, average 56 days). Method (b) is recommended, particularly for *Q. borealis*, because it is easier to carry out.

3014. BENZIE, J. W. Viability of Balsam Fir seed depends on age of tree. *Tech. Note Lake St. For. Exp. Sta.* No. 591, 1960. pp. 2. 1 ref.

In tests in a good seed-year in Michigan, viability was found to be related to tree age in trees 40–155 years old. Best results were obtained from a tree aged 41 years with an actual germination 40 days after sowing of 63% and a potential (i.e. including sound seed ungerminated) of 68, vs. 3 and 10% for a

155-year-old tree. The potential germination of seed from trees ca. 30 years old ranged from 8 to 57%.

232.32. Plant Rearing. Nursery Practice

3015. TIHOMIROV, B. A. Drevonasazhdenie v Grenlandii. [Tree stands in Greenland.] *Lesn. Zh.*, *Arhangel'sk* 2 (6), 1959 (164-8). 6 refs. [Russ.]

A brief summary of the literature on experience in establishing forest nurseries and plantations in Greenland [cf. *F.A.* 17 No. 1448; 20 p. 328].

3016. SANTOS, H. J. ABRANTES DOS. Resultados de algumas experiências efectuadas com várias espécies florestais nos viveiros do nordeste. II. [Results of experiments with various forest species in the nurseries of the Northeast, [Azores]. II.] *Estud. Inform. Serv. Flor. Açúic.*, Portugal No. 123-D2, 1960. pp. 25. [Port.] Limited distribution.

Presents information on (1) weight and volume of planting stock from the Viveiro do Nordeste, (2) purity, number of seeds per kg., and 1000-seed weight for seed of 9 species received by this nursery in 1958, (3) weight of pure seed of *Cryptomeria japonica*, (4) the influence of density of sowing on planting stock of *Pseudotsuga taxifolia* and *Cupressus lusitanica*, and (5) methods used in measuring planting stock of *Cryptomeria japonica*. [Cf. *F.A.* 20 No. 3078.]

3017. KARSCHON, R. Studies in nursery practice for Carob (*Ceratonia siliqua* L.). *Leaf. Dep. For. Israel* No. 14, 1960. pp. 8. 3 refs. [E.]

The following conclusions are drawn from trials: the size of seeds is liable to vary according to the seed lot; the best seed treatments before sowing are soaking (a) in concentrated H_2SO_4 for 1 hour and then in water for 24 hours, (b) for 24 hours in water which has been brought to the boil; the cutting test and excised-embryo test were suitable for assessing viability; autumn and early spring are the best sowing seasons; seed rot can be controlled by soil sterilization; direct sowing without transplanting produces superior stock; larger containers (tins) result in better growth of the plants.

3018. MÁRKUS, L. A mintavételek csemetebecslés. [Plant population estimates by sampling.] *Erdő* 8 (9), 1959 (344-9 + smries. in suppl.). [Hu. russ.g.]

Explains, with tables and a form, a statistically based, simple, rapid, and cheap method of adequate accuracy for sampling nursery populations from a mean of counts along a metre stick. A table shows size of sample required for a given standard deviation.

3019. Plastic labels. *FAO For. Equipm. Note* No. A.23.60, 1960. pp. 1.

Describes a hand machine which produces plastic strip with adhesive backing, punched to any lettering desired, and suitable for use in nurseries, plantations etc. It is manufactured by the Roovers-Lotsch Corp., Brooklyn, N.Y.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 2857, 2867, 2868, 3225, 3423, 3715.

3020. AHROMEJKO, A. I., and SAVINA, A. V. Vlijanie fosfornyh udobrenij na rost sejancev drevesnyh porod. [Effect of P fertilizers on the growth of tree seedlings.] *Vestn. sel'. hoz. Nauki, Moskva* 5 (11), 1960 (100-8). 3 refs. [Russ.e.g.f.] O.W.

Essentially the same as work already noticed [see *F.A.* 22 No. 1740].

3021. HORVÁTH, L. Erdeifenyőcsemete nevelése homokon altalajtrágyázással. [Raising Scots Pine seedlings on sands by deep manuring.] *Erdő* 8 (12), 1959 (469-72). [Hu.] From *abstr. in Hung. agric. Rev.* 9 (2), 1960 (17). [E.] C.G.B.

By placing a 5- to 10-cm. layer of manure at a depth of 50-60 cm., adding humus to the topsoil, and sowing in 10-cm. strips, 400-500 seedlings/m. could be raised without irrigation or shade. Production of 1-year seedlings is 6,000,000/ha.

3022. MULLIN, R. E., and LEECH, R. W. A field test of Dunemann stock. *Res. Rep. Ont. Dep. Lds. For.* No. 41, 1959. pp. 25. 16 refs.

Pinus resinosa, *P. strobus* and *Picea glauca* 2 + 0 stock raised by this method [cf. *F.A.* 18 No. 1520] was compared with normal 2 + 2 and 2 + 1 planting stock from the same nursery, in respect of survival and height growth 2 years after planting out. Results showed that Dunemann stock of all species suffered greater mortality than normal 2 + 2 stock; Dunemann stock of *P. strobus* and *P. glauca* had lower and that of *P. resinosa* higher mortality than the corresponding 2 + 1 normal stock. Dunemann stock of *P. resinosa* and *P. glauca* had lower height growth than either 2 + 2 or 2 + 1 stock; height of *P. strobus* was not measured. Further field trials are needed if the method is to be justified.

232.323. Sowing and Covering

See No. 3026.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 3248-9.

3023. MRAZEK, F. Der Objektlohn als neue Lohnform für die Pflanzenanzucht. [Wages for the job—a new wages system for plant raising.] *Forst u. Jagd* 10 (11), 1960 (570-1). [G.]

Describes a system of fixing an over-all rate for tending given seed and transplant beds from May to September, based on the time required for five hoeings with a rubber-wheeled hand hoe. The workers, who are said to like the system, get one-fifth of the amount advanced each month if the job is well done. There are deductions for scamped work, additions for difficulties, and a profit-sharing scheme. The quality of the work is said to have been much improved as compared with work on hourly or area rates.

3024. PAPP, L. Szükséges-e a gyomtalan talaj lazítása? [Is it necessary to loosen weed-free soil?]

Erdő 9 (7), 1960 (265-9 + smries. in suppl.). 7 refs. [Hu.russ.g.]

Reports 3 seasons' studies on soil temperature and moisture and concludes that, until the needs of various species and the economic aspect are clarified, soil loosening should be continued in view of its beneficial effects on heat and water regimes.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

3025. KARSCHON, R. Nursery techniques for Eucalypts. II. Combined top and root pruning. *Leaf. Dep. For. Israel* No. 13, 1960. pp. 6. 6 refs. [E.]

[Cf. *F.A.* 22 No. 1751.] Combined top and root pruning of pot-grown *Eucalyptus rostrata* was done once, twice, or three times in a season. With fast-growing stock, repeated top and root pruning produced sturdier, thicker stems than unpruned controls or stock pruned only once. With slow-growing stock, top and root pruning had no significant effect on top and root development.

232.327. Protection Measures in Nurseries

See also Nos. 3263, 3423.

3026. Improvement in nursery techniques. *Extr. from Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (18).

In trials designed to find a satisfactory bird repellent, it was found that grit as a seed cover did not prevent attack on the seeds by house sparrows, which dig for seed, but did protect them from chaffinches, which only take seed visible on the surface. Pink-coloured seed, on the other hand, was repellent to sparrows but not to chaffinches. The successful treatment of conifer seed to repel birds has been reported by a number of nurseries. The repellent used is primarily a fungicidal dust [white thiram] for preventing pre-emergence seed rot. Mice will take the treated seed, but they are not a serious problem in most nurseries. In a trial in which *Pinus radiata* seedlings were raised under a cover of scrim treated with undiluted Cu naphthenate as a preservative, the seedlings were longer between the root collar and the cotyledons, as might be expected under the more heavily shaded conditions, but were also of a more bluish tinge than is usual. Chemical analysis showed them to have a much higher Cu content than normal. The development of these seedlings appeared to be unimpaired.

3027. BURA, D. Zaštitne mere u rasadnicima i plantažama topola. [Protective measures in Poplar nurseries and plantations.] *Topola, Beograd* 4 (13/14), 1960 (11-3). [Serb.f.]

Lists destructive diseases and fauna of Yugoslavia, with means of combating them.

232.328. Vegetative Propagation

See also No. 3126.

3028. HARKAI, L. Dugványkihozatali vizsgálatok a bajti országos nyár törzsanyatelepen. [Cutting production studies in the State Poplar clone garden

at Bajti.] *Erdő* 9 (6), 1960 (201-4 + smries. in suppl.). 2 refs. [Hu.russ.g.]

Investigates the production in a new garden of cuttings from 7 clones from a 4- to 5-year-old garden. It is considered that such gardens should be worked for 7-8 years, then heavily fertilized and sown to agricultural crops for 1-2 years. The clones were of *P. × canadensis*, *P. nigra* and *P. deltoides* × *P. italica*.

3029. WELLS, J. S. Pointers on propagation: plant hormones—a modern aid. *Amer. Nurseryman* 113 (2), 1961 (12-3, 84-9). 3 refs.

Discusses the use of growth regulators, especially IBA and NAA, separately or mixed, with or without the addition of fungicides, in different carriers and at different concentrations. Species for which recommendations are made include *Taxus* and *Juniperus* spp.

3030. WEISER, C. J., and BLANEY, L. T. The effects of boron on the rooting of English Holly cuttings. *Proc. Amer. Soc. Hort. Sci.* 75, 1960 (704-10). 9 refs. E.M.B.

Stem cuttings of *Ilex aquifolium* were soaked at the base for 12 hr. in aqueous solutions of IBA and H_3BO_3 , both singly and in combination. The treatments increased (1) the % of rooted cuttings and (2) the number and (to a lesser degree) the length of roots; the processes were also hastened. B seems to enhance rooting of Holly through a synergistic interaction with IBA. Considerable variations were found in the concentration of B giving maximum rooting stimulation. *From authors' summary.*

3031. BOGDANOV, B. Vlijanie na njakoi rastežni stimulatori vārhu ukorenjavaneto na reznici ot rābest čaškodrijan (*Evonymus europaea* L.). [Effect of some growth regulators on the rooting of *E. europaea* cuttings.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (137-68). 29 refs. [Bulg.e.]

The use of α -NAA, β -IBA, and 2,4-D [see *F.A.* 21 No. 4330] did not increase the rooting % in this species, but did result in a more vigorous root system.

3032. GIORDANO, E. La propagazione vegetativa degli eucalitti. [The vegetative propagation of Eucalypts.] *Cellulosa e Carta* 11 (12), 1960 (5-10). 11 refs. [It.f.e.g.]

Describes experiments in propagating Eucalypts by layering and by cuttings. Satisfactory results were obtained by layering 2-year-old *E. rostrata*. Experiments with cuttings of a number of species confirmed the decisive importance of age of parent. Rooting of cuttings taken from 1-year-old plants depended largely on the date of collection and the moisture of the medium.

3033. [Patch grafting.] *Extr. from Rep. Qd. For. Serv.* 1959/60, 1960 (17-8).

Further progress has been made in the matter of vegetative propagation of *Araucaria cunninghamii* [cf. *F.A.* 17 No. 2741] by the use of "patch" grafts with dormant buds taken from the main stem. This method has been extended to grafting in the field, using bark patches from the leading shoot of trees

30 years old. Stocks were 3 years in the field and 8-9 ft. high. In all, 96 grafts were attempted and all took. The outstanding feature of this method is the rapid elongation of the scion. Shoots produced are typical leader type, whereas grafts using first-order branches retain their branch habit after 4 years in the field and even if staked. Patch grafting of *Agathis australis* was also tested on a small scale and though % take and rate of growth were less, they were quite satisfactory.

3034. LESKINEN, U. Kokemuksia männyn varttamisesta Suomessa. [Experience in grafting Pine in Finland.] *Metsät. Aikak.* 1960 (11), (399-402, 405-6). 6 refs. [F.i.e.]

Since 1949, ca. 85,000 Pine grafts have been made, mainly for seed orchards. At first grafting was done in the spring on potted stocks in the greenhouse or in the open; recently summer grafting has given better results. It is concluded from experiment and practical experience since 1957 that: the best period for grafting in S. Finland is 20 June-15 July, when diam. growth is at its maximum; the scions of the current summer's growth should be collected immediately before grafting; grafting is most successful when done on the leader (i.e. on the current year's growth); spring clothes-pegs to keep the grafts in position have given promising results but a lower % of successful grafts than rubber strips; no wax is necessary; results are best in warm weather, and better in a plastic greenhouse than in the open. *From author's summary.*

3035. EN'KOVA, E. I., and LYLOV, G. I. Šire primenjat' privivki duba pri sozdanii semennyh učastkov. [The use of grafting in the creation of Oak seed orchards.] *Lesn. Hoz.* 12 (6), 1960 (34-6). [Russ.]

The stocks used were Oaks [*Quercus robur*] established by direct sowing in 1952 and 1-2 m. high and 1-2.5 cm. in diameter; the scions were 1-year shoots from Oaks 12 and 135-150 years old. Grafting was found to be perfectly suitable for the creation of seed orchards. In the best method of three tried the stock was cut through obliquely (45°), the lower edge being 0.5 cm. above the root collar, and the cut surface facing N. The bark at the upper edge of the stock was loosened from the wood by finger and thumb, forming a "bag" or slit into which the prepared scion was inserted. The graft was then bound, and earthed up. This gave up to 100% survival, and some 1-year grafts attained heights of 160-180 cm. The best time for grafting was when the leaf buds opened on the Oaks destined for stocks. Scions from the late-flushing variety took better than those from the early-flushing variety, and exhibited greater vigour, while 1-year scions from younger trees did rather better than those from older trees.

3036. KEIDING, H., and BOONKIRD, S. Vegetative propagation of Teak. *Unasylva* 14 (4), 1960 (193-4). 2 refs.

Describes successful experiments in budding Teak by a method extensively employed on *Hevea brasiliensis*. Ca. 200 successful bud-grafts were made and, by the end of the first growing season, all

but 3 (killed by termites) were flourishing and had reached a mean height of 1.78 m. Grafting was done just above ground level. [Cf. F.A. 22 No. 461.]

3037. SERR, E. F. Blackline in Walnut. *California Agriculture, Berkeley* 13 (3), 1959 (8-9, 14-5).

The effect of blackline, the death of a narrow strip of cambium and bark at the union of *Juglans regia* top and rootstock, indicating a delayed incompatibility between them, is discussed and illustrated. Salvaging methods are described and recommendations made for practices in areas where the condition is prevalent. No secondary factors have been found to account for its greater severity in some areas.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

3038. SÓLYMOS, R. A rezgőnyár csemete termelés új módszerei. [New methods of raising Aspen in the nursery.] *Erdő* 9 (2), 1960 (68-71 + smries. in suppl.). [Hu.russ.g.]

Pricking out seedlings from cold frames on the maturing of the first cotyledon-pair has proved very successful. With two prickings-out, plants can reach a mean height of 205 cm. vs. 120-130 cm. for only one, by the following autumn. When held all the year in the cold frame, heights of 180 cm. are reached (against 15-35 cm. in the open).

3039. Eucalypt research. *Extr. from Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (16-8).

The most notable finding from an initial survey of Eucalypt stands in North Island is the close parallel between the site preferences exhibited by the various species in New Zealand and in their natural habitats in Australia. In general, species have not proved adaptable to increasing cold, and the closer they approach their climatic limits, the more site-demanding they become. Experiments in various methods of nursery practice have led to an improved mossing practice, which is the most promising technique for large-scale application. Seedlings are raised in open seedbeds and induced to form fibrous roots by frequent early cultivation and light wrenching. The hardened seedlings are lifted in late summer or autumn, when 6-9 in. high, their roots are enclosed in a cylinder of moist sphagnum moss, wrapped in a 6 x 8-in. piece of thin polythene film, and packed into a standard nursery seed-tray with 80-96 trees per tray. Seedlings thus re-rooted in autumn or spring are ready for planting 4-8 weeks later, but those mossed during the winter remain fairly dormant unless bottom heat is applied. Mossed stock can be held for a considerable time in the nursery without becoming root-bound, while growth can be stimulated, if necessary, by applying liquid fertilizers. A full tray of 96 seedlings carried in a specially designed aluminium frame, is quite light and convenient to handle on the planting site, and both the tray and the polythene are easily recovered.

3040. BØRRESEN, E. Huminalpotter i skog. brukets tjeneste: 4 års erfaringer med Jiffy-potter-

[Peat pots in forestry: 4 years' experience with Jiffy pots.] *Norsk Skogbr.* 7 (3), 1961 (106-7, 120). [Nor.]

In the first experiments, 2 + 0 Spruce plants were planted in the pots and left for 2 seasons before planting in the field; at the end of this time, however, the pots were tending to break up and there was some damage to the roots. In subsequent years, therefore, 3 + 0 plants were used, and planted out after one year. The potted plants stood in frames 11 × 27 in. with sides 4 or 6 in. high and a wire-netting base. Results were best when the pots stood on polyethylene sheeting. Mortality was very low; figures for those planted in the spring of 1959, just after the drought began, showed a loss of 8% for the potted plants, vs. 68% for normal bare-rooted planting in similar conditions. Calculations of cost, allowing for 20% replacement with bare-rooted planting, show that costs will be at least Kr. 1.58 per dekaré less for the potted plants. A further advantage is that the potted plants show little or no growth check after planting out. They are particularly suitable for weed-grown sites. It has proved possible to plant throughout most of the year, except during deep snow. Planting in frozen soil in November, using a power hole-borer, gave almost complete success. [Cf. *F.A.* 19 No. 4131.]

232.33. Formation of Stands by Direct Sowing

See also Nos. 2946, 3123.

3041. ŽETKO, A. Andrejašičeve proste setve črnega bora na krasu. [Andrejašič's broadcast sowings of *Pinus nigra* on karst.] *Gozd. Vestn.* 18 (9/10), 1960 (284-9). [Sloven.]

A short account of the sowings, which were started in 1952 and involve no site preparation. In 1952-60 inclusive, 361.5 ha. were sown at 400-900 m. alt., using seed rates of 3-4 kg./ha. Of the 209.5 ha. sown up to and including 1958, 58.5 ha. carried 9000-45,000 young Pines/ha., and only 30 ha. had <1000 Pines/ha.

3042. PATRANIN, A. V. O nekotoryh osobennostyah hoda rosta kul'tur sosny v vysotu v borovyh tipah lesa Vologodskoj oblasti. [Some features of the pattern of height growth of planted or sown Scots Pine in *Pineta* of the Vologda region.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (13-6). [Russ.]

A comparison of height growth up to the age of 5, from planting and direct sowing, both on cleared patches and in ploughed furrows, in the *Pinetum cladinosum* and *P. vacciniosum*.

3043. PHARES, R. E., and LIMING, F. G. Comparative development of seeded and planted Shortleaf Pine on a forest site in the Missouri Ozarks. *J. For.* 58 (12), 1960 (957-9).

In a study on the introduction of *Pinus echinata* in a low-grade *Quercus marilandica*/*Q. stellata* stand, the overstorey was removed, and spots at 6.6 × 6 ft. spacing were sown in April 1941 with 10 seeds per spot. A year later, only 30% of spots were stocked with (a) seedlings from the seed. Vacant spots were then planted with (b) 1 + 0 stock in April 1942. A comparison of growth from 1942 to 1956 showed

that though (b) were initially taller, (a) soon established and maintained a height advantage of ca. 1 ft., growing faster under all degrees of hardwood competition. Survival of (a) was also better; 88% of spots with living seedlings in 1942 were stocked in 1956, vs. 58% of planted spots.

3044. MALAC, B. F. Effects of site preparation on success of direct seeding of Slash Pine. *Woodl. Res. Note Union Bag. Pap. Corp., Savannah* No. 6, 1960. pp. 4.

Site treatments tested on 1083 plots were: (a) none, (b) a fresh burn, (c) shallow strip-disking with a fire-line plough or (d) over-all diskling with a heavy disk harrow. Seed was sown from the air. All site treatments improved milliacre stocking and number of seedlings per acre, (b) being the least and (c) the most effective. The relationship between preparation and stocking or distribution was not affected by variations in amount of seed used, drainage, or density of ground vegetation. Woody plants offered the most severe competition to young seedlings, followed by grasses, especially sod grasses; annuals provided the most favourable conditions for the seedlings. Ground-cover types were closely related to site preparation. Results of the study are shown in graphs and tables.

3045. MANN, W. F., JR., and BURKHALTER, H. D. The South's largest successful direct-seeding. *J. For.* 59 (2), 1961 (83-7).

Broadcast sowing from the air and sowing in furrows, using repellent-treated seed, proved successful in establishing *Pinus taeda* and *P. palustris* on a clear-felled area of 18,545 acres in central Louisiana. The weather (1958-59) was favourable, and initial and first-year stocking were satisfactory with both methods, ground preparation by burning and/or diskling giving no marked increase. A small Bell helicopter sowed ca. 3000 acres/day vs. 1200 for a fixed-wing Piper P18A. Costs of comparable commercial operations are enumerated; sowing costs about half as much as planting, at a quarter of the capital outlay. [Cf. *F.A.* 20 No. 4490.]

3046. Aerial seeding. *Newslett. N.Z. For. Serv.* 10 (12), 1960 (6).

Experimental sowing of Radiata Pine on a cut-over Radiata Pine area at Kaingaroa from a Fletcher aircraft, indicated that excellent distribution can be obtained by sowing a 50:50 mixture of Pine seed and wheat at 6 lb./acre. At this rate cross-sowing is possible and no ground control of flying lines is necessary. Total cost, including ground check, seed, etc. was £6. 17s./acre.

3047. Establishment methods [: direct sowing]. *Extr. from Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (18-9).

Direct sowing of *Pinus radiata* seed after clear felling was a failure, all the seed being consumed by chaffinches. Treatment of seed with aluminium powder appeared to facilitate the discovery of the seed by the birds. A trial of sowing in lines beneath the stand before felling, following the planting lines of the existing stand and using seed treated with

fungicidal (thiram) dust, gave promising results—15 months after sowing, seedlings were established on the sown area at a rate of 4500/acre vs. 400–500/acre on the unsown remainder of the compartment which was felled simultaneously.

3048. O'KEEFE, M. P. **Tree seeding by helicopter.** *Soil Conserv.* 26 (4), 1960 (91–2).

Describes the successful December sowing of 110 acres of scarified brush in Clark County, Wash., with Douglas Fir seed. At a sowing rate of 20,000 seeds/acre, survival up to 16,000 seedlings/acre has been reported. Total cost per acre was \$15 for scarifying the land, and \$9.75 for sowing by helicopter (this included cost of seed, repellent treatment, and application). [Cf. *F.A.* 19 No. 2964.]

3049. CROKER, T. C., JR. **The H-C furrow seeder.** *Tree Plant. Notes* No. 43, 1960 (15–6).

[Cf. *F.A.* 21 No. 4346.]. Includes 6 photographs of the machine in action.

232.4. Formation of Stands by Planting

See also Nos. 3042–3.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 2980, 3016, 3022, 3039–40, 3518.

3050. PAPP, L. **A csemete mintősege és az erdősiség sikere.** [Quality of plant material and success of planting.] *Erdő* 8 (9), 1959 (335–43 + smries. in suppl.). 5 refs. [Hu.russ.g.]

For planting more difficult sites, the author found that 2-year-old Scots and Austrian Pine of 10 mm. root-collar diam. were less suitable than plants of 3–10 mm. diam. Chief criteria are amount of roots and root/shoot ratio. Those plants are suitable which have their aerial parts not more than 3 times the weight of their subterranean parts when lifted for planting.

3051. FOULGER, A. N. **Growth of oversize Slash Pine seedlings following outplanting.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 7, 1960. pp. 2.

Measurements in 1955–59 showed that differences in height between oversize and control seedlings were by the end of the period too slight to justify seedbed selection of Slash Pine. Differences in survival % after 4 and 5 growing seasons were also slight.

3052. FRÖHLICH, W. **Die Anzucht von Lärchen-Willdingen.** [Raising Larch wildlings.] *Forst u. Jagd* 11 (1), 1961 (33–4). [G.g.]

To utilize to the full the few sources of genetically good seed in E. Germany, the soil of seed-bearing stands is prepared by ploughing and harrowing, the resulting seedlings (which spring up in great numbers) being weeded as necessary. After two growing seasons the seedlings, ca. 10–20 cm. high, are transplanted to the nursery. In another two years they have grown 50–80 cm. high and developed a good root system, and are ready for planting out.

3053. OSBURN, V. R. **Effect of two commercial preparations on root initiation of Douglas Fir nursery stock.** *St. For. Note Calif. Div. For.* No. 4, 1960. pp. 5.

[Cf. *F.A.* 20 No. 4501.] Small-scale experiments were made to test the effects of (a) Gro-fast (100 p.p.m. gibberellic acid) and (b) Transplantone (containing naphthylacetamide and Vitamin B₁) in stimulating the early initiation and growth of roots. Douglas Fir 2 + 0 seedlings, root-pruned to a uniform length of 8 in. were treated by spraying with (a) (tops, roots, or tops and roots) or by standing the roots for 2 hours in a standard solution of (b) before planting out. Treatment with (a) did not significantly increase either top or root growth, but seedlings treated with (b) showed improved length and density of root systems and better crown development, and this beneficial effect was maintained through the second growing season. Treatment with Transplantone is simple, inexpensive, and adaptable to nursery or field conditions.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 2855, 2978, 3040, 3079.

3054. PODHORSKI, I. **Kaptažni uzgoj topola u plantažama.** [The channel and drain method of raising Poplar in plantations.] *Šum. List* 84 (7/8), 1960 (220–2). [Croat.g.]

Describes and illustrates a method whereby all precipitation is channelled directly to the roots of planted Poplars. Pits ca. 1 m. deep are dug in rows. Into one side of each pit is placed vertically a metal pipe 13 cm. in diameter and 0.8–1 m. long, with two handles on its upper rim. This pipe is filled with medium-sized gravel, the Poplar is placed in the pit, and the pit filled with earth. The metal pipe is then pulled up, leaving a column of gravel from ground surface to the base of the pit. A channel runs along each side of the rows. The channel on one side links the gravel drains, and is connected to the other at intervals. The ground between rows is slightly cambered to aid run-off. Any precipitation that falls thus runs into the channels, and from them into the gravel pipes and straight to the soil at the level of the Poplar roots. The amount of gravel required per hectare at 7 × 7 m. spacing (200 pits), using a pipe 80 cm. long by 13 cm. in diam., would be 2.13 cu. m. A bundle of sticks of roughly the dimensions of the pipe can be used instead of gravel and pipe; Poplar and Willow sticks should be avoided because of the risk of infection. The method was used in spring 1960 in an experimental plantation at Koprivnica, N. Croatia, and is being tested further. [No costs given.]

232.43. Spacing and Arrangement in Plantations

See also Nos. 2939, 3070, 3094, 3121.

3055. KRAMER, H. **Kulturverbandsversuche.** [Plantation spacing trials.] *Forst- u. Holzw.* 15 (23; 24), 1960 (496–500; 512–8). 32 refs. [G.]

Reviews many spacing trials in several parts of Germany with Scots Pine and Norway Spruce,

including some data on relative performance, and others with European and Japanese Larch, Oak, and Beech. With Pine, on very fresh, loamy soils, and extremely poor sites, spacings 0.4–1 m. in, and 1.3 m. between, rows, or at 1×1 m., are recommended; on fresher, medium soils, 0.33–0.6 m. in, and 1–1.2 m. between; on drier medium soils 0.4–0.6 and 1.3 m. With Spruce, on the drier, poorer sites, 1.8×1.8 or 2×2 m. has given good results; on the best sites, within the natural range of the species, the best square spacings are 1.3–1.6 m.; square spacing is superior to row planting at the same number of trees per unit area.

3056. [Spacing trials with Spruce and provenance trials with Pine laid out by the Skogsforskningsinstitut at Frösö, Jämtland.] *Norrlands Skogsv-Förb. Tidskr.* 1960 (4), (429–59). [Sw.]

Comprises descriptions of the trials and discussion of them at the Norrlands Skogsvårdsförbund's 1960 excursion. (a) In the spacing trial, $2 + 0$ Spruce was planted in 1916, at 3-, 2- and 1.5-m. spacings. Data from various measurements of stand development from 1924 to 1957, of values per ha. and of planting costs are tabulated. Value per ha. in 1956 was greatest for the 2-m. spacing. Establishment costs were ca. Kr. 196, 430, and 770 per ha. for 3-, 2-, and 1.5-m. spacings respectively. (b) The provenance trial was laid out in 1911, using $2 + 0$ Pine from seed collected in 19 areas in different parts of Sweden. The site used was a favourable one, and differences in survival, increment and tree quality between northern and southern provenances are unusually slight.

3057. BENNETT, F. A. Spacing and early growth of planted Slash Pine. *J. For.* 58 (12), 1960 (966–7).

The growth of 8 spacings of *Pinus elliottii* planted on an old-field site in Georgia was compared after 7 years. Diameter growth was directly proportional to stand density. At a density of 500–550 trees/acre, competition began to have a significant effect during the 5th year, the effect intensifying in the 6th and 7th years. Diameter growth was not correlated with configuration (oblong vs. square spacing), nor height growth with stand density. The crown ratio % was highly correlated with stand density.

3058. SHIDEI, T., and TADAKI, Y. [Studies on the competition of forest trees. (1) The effect of nest planting on interspecific competition.] *J. Jap. For. Soc.* 40 (8), 1958 (325–31). 11 refs. [Jap. jap. e.e.]

Presents the results [tables and graphs in English] of an experiment to ascertain the effect of nest-planting 2-year *Cryptomeria japonica* seedlings (and enclosing them with weeds or hardwood seedlings) on interspecific competition. The fewer seedlings per nest, the greater was the influence of other species. Detailed comparisons with controls are given.

3059. SZODFRIDT, I. Tolnaszigeti késeinyár hálózatkísérlet. [A spacing trial with *Populus × serotina* in Tolnasziget.] *Erdő* 9 (7), 1960 (247–51 + smies. in suppl.). [Hu. russ. g.]

Trials at 2×2 , 4×4 , 6×6 and 8×8 m. showed (at the 10th year in local conditions) 2×2 to yield greatest volume, and 4×4 the greatest value. Where hand labour is used, 2×2 thinned to 4×4 m. in the 3rd or 4th year is recommended; for mechanical cultivation, planting at 3×1.5 m.

3060. KARSCHON, R. Effects of spacing and irrigation on yield of Eucalypts and Casuarina. *La-Yaaran* 10 (1/4), 1960 (9–11, 61–58). 3 refs. [Heb. e.]

Shows the advantage of wider spacing in the production of wood chips, posts, pulpwood and poles in *Eucalyptus camaldulensis* spaced 2×2 and 3×3 m. With 6- to 8-year *E. robusta* and [9-year?] *Casuarina* sp., irrigation improved the volume m.a.i. six- and almost two-fold respectively.

233. Afforestation

See also Nos. 3015, 3323, 3518, 3961, 3967.

3061. VOYSEY, J. C. An assessment of the replanting of some opencast coal sites in South Yorkshire. *Quart. J. For.* 55 (1), 1961 (24–34). 11 refs.

Concludes from experience at 27 planted sites (312 acres), mainly ex-woodland restored and replanted since 1948–49, that soil cultivation as deep as possible is necessary before planting, to offset the loss of structure; subsoiling should be tried on a wider scale; grassing before planting is called for only on the steepest slopes, to check erosion; water-courses need special treatment to prevent gully erosion; the degree of atmospheric pollution should influence the choice of tree species; a pioneer catch-crop of Corsican Pine/Japanese Larch seems a wise choice.

3062. ANDERSON, M. L. Afforestation of upland heaths. *Nature, Lond.* 190 (4771), 1961 (136–7).

A review of J. W. L. Zehetmayr "Afforestation of upland heaths" [cf. *F.A.* 22 No. 1794].

3063. BERGSTRÖM, B. Om beskogning av de av ålder kala hed och torvmarkerna i Storbritannien. [Afforestation in Great Britain of heath and peatlands that have had no tree growth for centuries.] *Svenska SkogsvFören. Tidskr.* 58 (4), 1960 (255–80). 8 refs. [Sw.]

A discussion of British Forestry Commission methods and results, based on a study tour and published reports, and including brief notes on trials on similar sites in Halland [S. Sweden] established from 1953 to 1956 with *Pinus sylvestris*, *P. contorta* var. *latifolia*, *Picea abies*, *P. omorika*, *P. mariana* and *Larix leptolepis*, the last named being best on peat soils. Early growth of *P. omorika* was better than that of *P. abies* on heathland. The latter was greatly helped by interplanting with Larch and other species, and by mulching. NPK was more effective than P alone [cf. *F.A.* 20 No. 4948], but certain mixed commercial fertilizers caused plant injuries, attributed to Cl content.

3064. Flyschkurs 1959. [Course on flysch afforestation], 1959.] *Schweiz. Z. Forstw.* 111 (11), 1960 (598–64 + 12 photos.). 42 refs. [G.f.]

Reports on a course held at Liestal, including a general Introduction (*G. Naegeli*); Notes on

vegetation and forest types (*P. Grünig*); Water- and air-content determination on waterlogged soils (*F. Richard*); Aerial photos for distinguishing afforestation types (*A. Kurth et al.*) [closed or gappy plantations, natural stands, approximate areas and tree heights could be distinguished]; and The technique of *flysch* afforestation (*H. Leibundgut*) [cf. *F.A.* 15 No. 246; 16 No. 1705; 17 No. 2781].

3065. LUTZ, J. L. Zur Mooraufforstung. [Bog afforestation.] *Mitteilungen für Landkultur, Moor- und Torfwirtschaft, München* 7 (2), 1959 (61–86). 16 refs. [G.] A.P.B.

Briefly describes the natural forest vegetation—Alder, Birch, *Pinus cembra*, *P. mugo* etc.—on various types of bog in Bavaria, including transitional forest types springing up after draining and/or peat cutting, and discusses their amelioration and conversion. Examples of afforestation on different bog sites are also described, including soil preparation, draining, planting methods, species, fertilizer treatments [cf. *F.A.* 18 No. 4042], costs, and financial returns (based on afforestation of a raised bog with Spruce in the early 19th century, after artificial sedimentation of water from a stream. Species used included Spruce, Scots Pine, Weymouth Pine, Birch, Alder, and Poplars).

3066. LEGANCEV, M. I. Lesorazvedenie v polupustyne Zapadnogo Kazahstana. [Afforestation in the W. Kazakhstan semi-desert.] *Priroda, Moskva* 49 (12), 1960 (104–5). [Russ.] A.P.B.

A short general account of the performance of Scots Pine in plantations on the Urda sands. It grows well up to the age of 30 (but increment drops off sharply thereafter), develops an extensive superficial root system with 1 or 2 tap-roots, and starts to fruit early (7–8 years).

3067. KOVALIN, D. T. Lesonasaždenija Egipta. [Forest plantations in Egypt.] *Lesn. Hoz.* 10 (4), 1957 (88). [Russ.]

A brief general account of sand fixation and shelterbelt planting.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 2861, 3277.

3068. WILLISTON, H. L., and McCLURKIN, D. C. Soil moisture—seedling growth relations in conversion planting of Oak ridges to Pine. *J. For.* 59 (1), 1961 (20–3).

Height growth, survival, soil moisture down to 4 ft., and tip-moth damage were recorded for plots of *Pinus taeda* seedlings planted in Oak stands in which (a) the overwood, (b) the underwood, and (c) all hardwoods, were girdled or cut back, and poisoned. Treatment (c) was best on all counts. Though it gave the highest moth incidence, the type of damage was least important. Treatment (a) was next best. Costs of (a), (b) and (c) were \$6.56, 31.07 and 35.32/acre.

3069. PRIGNON, M. Mesures microclimatiques en pessières âgées: leur influence sur l'introduction

des essences dites "sciaphiles". [Microclimatic measurements in old Spruce stands: their bearing on the introduction of so-called shade-bearers.] *Bull. Soc. For. Belg.* 67 (12), 1960 (429–44 + 4 photos). [F.f.]

A study was made of experimental introductions of shade-bearers (*Abies alba* and *Tsuga heterophylla*) in mature Spruce stands, by three methods: (a) planting up of clear-felled areas of 10–30 ares, (b) group planting under thinned canopy (crowns ≥ 2 m. apart), (c) group planting under normal canopy (crowns just touching). Each of these might have (1) bare soil covered with needle litter, (2) ground cover of hair-grass and *Vaccinium myrtillus* or (3) a more or less dense thicket of *Rubus idaeus*, *Sambucus nigra*, and *Sorbus* sp. Best results were obtained by (a3), with clear-felled areas of ca. 20 ares, heavily colonized by *R. idaeus*, needing only 0–10% beeting up. Other results were (b3) 5–20%, and (b1) or (b2) and (c1) or (c2) 20–70% beeting up. The beneficial effect of a Raspberry thicket seems to indicate that the chief enemies of young Fir are desiccation of the air at ground level and of the soil. It is suggested that the concept of "shade" as a positively beneficial factor is erroneous; relative humidity and illumination can not be dissociated, and together form the "freshness complex". The Raspberry thicket, from this point of view, provides an ideal environment; in addition to its other advantages, it provides shelter against frost—another enemy of the conifer seedling.

3070. HESMER, H. Unterbauversuche mit Winterlinde, Buche und Hainbuche in verschiedenen Verbänden unter Stieleichenstangenholz. [Underplanting trials with *Tilia cordata*, Beech and Hornbeam at various spacings under pole-sized *Quercus robur*.] *Forstarchiv* 31 (11/12), 1960 (185–92). 13 refs. [G.g.]

Experiments to establish a quick-growing, sufficiently dense understorey on a representative *Q. robur* site with heavy, waterlogged, gley-like loam in the Kottenforst showed that success depended on the species and spacing chosen and the prevalent game conditions. In 1950–52, seedlings of (a) *Tilia cordata*, (b) *Fagus sylvatica*, and (c) *Carpinus betulus* were planted in plots of various sizes under *Q. robur* (sown in 1904), at spacings of 0.33, 0.5, and 1 m., and (a) also at 2 m., in rows 2 m. apart. Measurements in autumn 1959 to the highest living point of each seedling showed that (a) had the greatest mean height, that of (b) being 66% and of (c) 26% of (a). Height growth was greatest on 2×1 -m. plots. A single application of fertilizers on certain plots produced an increase in height over unfertilized plots of 15–31% for (a), 7–15 for (b) and 6–7 for (c), but fertilizing was considered unnecessary on this site. The influence of a small number of Pines mixed with the Oak beneath which some rows of (a) passed, was noted on two plots: seedlings under the Pines flushed several days earlier than their neighbours under Oak alone, and had mean height advantages of 66 cm. at 2×0.5 m. and 21 cm. at 2×1 m. spacing. Grass was effectively checked on plots where (a) and (b) seedlings were 0.33–1 m. apart, but was unaffected on all (c) plots

(badly browsed by deer), and (a) plots at 2×2 m. (seriously damaged by antler rubbing). Roe and fallow deer were numerous in the area. In Oct.-Nov. 1959, rubbing damage was calculated on 28,431 (a) and (b) seedlings on an area of 3.49 ha., damage being assessed on each seedling by a system of grades from 0 (no damage) to 5 (broken and dead). It was found that (a) was much more subject to damage than (b), particularly in grades 4 and 5. Apparently the lighter branching of (a) makes its stem more attractive to deer; it is also more easily damaged than (b), and its bark peels more readily. A close correlation between distance of seedlings apart and % of seedlings damaged was established. With (a) at 2×2 m. spacing, damage was as high as 71%, but became tolerable where seedlings were 0.33-1 m. apart. A spacing of 4×1 m. was suggested as economic; preliminary trials show it to suffer considerably less damage than 2×2 m., while leaving space for silvicultural operations (extraction, etc.). Small plots suffered a greater proportional loss than large plots, since stems on plot borders were more easily approached and damaged than interior stems. Extensive plots are therefore recommended.

3071. McCURKIN, D. C. Legumes fail to benefit Loblolly Pine plantings in North Mississippi. *Tree Plant. Notes* No. 43, 1960 (11-2).

Three herbaceous legume species were planted with *Pinus taeda* seedlings in an attempt to improve survival and growth on severely eroded land. No benefit resulted—in fact trees did slightly better on untreated controls.

3072. KOČKAR, N. T. O smešannih sosnovologo-dubovyh kul'turah. [Mixed Pine/Spruce/Oak plantations.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (166-7). [Russ.]

Gives details of a Pine/Spruce/Oak plantation of 1 ha., established in 1938 and examined in 1951, and from this draws conclusions on the optimum species proportions and plantation lay-out for Belorussia.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 3248-51.

3073. PREOBRAŽENSKII, A. V. O vlijanii uhodov na rost kul'tur hvoynih porod na vyrubkah v Leningradskoj oblasti. [The effect of tending on the growth of conifer plantations established on clear fellings in the Leningrad region.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (3-7). [Russ.]

The survival and height growth of Siberian Larch, Norway Spruce and Scots Pine directly sown on cultivated patches, and also of planted Scots Pine, were investigated. On some plots tending operations (weeding, soil loosening, hoeing, etc.) were done. With Larch, tending ensured good survival and growth. Spruce from sowings on micro-elevations and rich soil needed no tending, and tall herbs sheltered the young trees from frost. With Pine, systematic tending was necessary to give the young trees light.

3074. JOVANOVIĆ, S. Dejstvo nekih herbicida na važnije korove u populikulturi. [The action of some herbicides on important weeds in Poplar plantations.] *Topola, Beograd* No. 15, 1960 (15-9). [Serb.f.g.]

Since mechanical control of weeds in plantations has proved impossible, tests were made with the following herbicides: (1) selective: Hedonal 'M' (MCPA base); Agroxone; Tributon; 'Duphar' 2,4,5-T; 2,4,5-T Mischöl AG-40; Sitosan (mixture of 2,4-D and 2,4,5-T); Fitoksol '15' (15% PCP in oil); Aporizon (*n*-butyl ester of 2,4,5-T); Deherban (2,4-D with MCPA); (2) total: Weedicide concentrate; Looerverbrander (As base); and TCA. For each herbicide found suitable, the concentration and quantity required per hectare, and costs are given for the eradication of *Rubus caesius* and *Amorpha fruticosa* in spring and in summer.

237. Amelioration of Forest Sites

See also Nos. 2694, 2698, 2703, 2858, 3054, 3060, 3065, 3123-5, 3212, 3216.

3075. LEYTON, L., and YADAV, J. S. P. Effect of drainage on certain physical properties of a heavy clay soil [on forest research plot, Waterperry, Oxon.]. *J. Soil Sci.* 11 (2), 1960 (305-12 + 2 photos). 6 refs.

Tests (apparatus and method described in detail) showed a higher content of water-stable aggregates, a higher % of larger pore spaces, and a greater lateral and vertical hydraulic conductivity in the drained soil. The difference decreased with depth, little remaining at 15 in. It can be interpreted as largely due to aeration.

3076. HEIKURAINEN, L. Mikä on metsäojituksen vaikutus metsiemme tuottokykyyn. [The possibilities of forest drainage in Finland.] *Metsät. Aikak.* 1960 (12), (439-42). [Fie.]

[Cf. *F.A.* 21 No. 465.] Ca. 3 million ha. of Finland's peatland could be drained economically and a further million could be drained but not economically. Ca. 1.4 million ha. of ordinary firm forest soils need drainage. Drainage which could be carried out in the next 30-50 years would increase m.a.i. by ca. 11 million cu. m. but the corresponding increase in the annual cut could not be achieved until the next century. *From author's summary.*

3077. KAPUSTINSKAITĖ, T. Dėl juodalksnynų nusausinimo. [Drainage of Alder stands.] *Liet. Miškų Ūkio Moksl. Tyr. Inst. moksl.-tech. inform. Biul.* No. 1, 1959 (3-5). [Lith.]

Lithuania has ca. 85,600 ha. of Alder woods, occupying ca. 40% of the marshy forests in the country, for which extensive drainage schemes are included in the coming Seven-Year plan. Experimental drainage [no details] has been done in the 5 recognized Alder types (described) in Lithuania and some 7 years' results are reported. All types except type 4 where Alder grows on 60-90 cm. peat mounds—showed, sooner or later, an appreciable check to growth, the mean reduction in the 10-to-15-year age class being 25% vs. undrained controls. In all types, effects were visible up to 200 m. from the ditches; adjacent Spruce was also slightly benefited.

3078. GÄBLER, H. Die Aussichten für einen erfolgreichen Einsatz von Flugzeugen bei der Düngung im Forst. [Prospects of forest fertilizing from the air.] *Forst u. Jagd* 11 (2), 1961 (77-8). [G.]

In an exploratory trial, 2400 kg. of granulated fertilizer were dropped, from an aeroplane loading 400 kg., on to Pine stands aged 6, 14 and 24 years on an area 625 by 90 m. (5.6 ha.). Each of the six flights treated two swaths of 8 m. in just over a minute, but total time was 1½ hours because loading (by hand) was slow. Distribution was good in all three stands despite strong wind.

3079. PRITCHETT, W. L., and ROBERTSON, W. K. Problems relating to research in forest fertilization with Southern Pines. *Proc. Soil Sci. Soc. Amer.* 24 (6), 1960 (510-2). 8 refs.

A series of experiments was conducted in Slash Pine plantations to check experimental technique. P³² measurements indicated that 2-, 3-, and 5-year-old Pines may feed out to a radius of ca. 19, 25 and 32 feet, respectively, on sandy soil. Root-grafting, as determined by the use of P³², appeared to occur in trees >5 years old. The size of plots depends upon the anticipated extent of the root system at the end of the experiment. At least 30 trees should be included for measurements, with surrounds to prevent cross-feeding. Except for experiments to be conducted for short periods on young trees, individual plots should be ca. ¼-½ acre in size. Depth of feeding, method of fertilizer application, and season of application are discussed. Care must be exercised when applying fertilizer at time of transplanting to prevent burn. Concentrations exceeding the equivalent of 300 lb. of soluble N or K₂O per acre may result in reduced growth and survival of newly planted Pine on sandy soil. It appears that fertilizing should be delayed at least 1 year after transplanting in order to reduce the danger of burning, leaching losses, and competition from weeds. *From authors' summary.*

3080. LAFOND, A. Effet de la fertilisation en N et K sur des plantations de *Picea glauca* et de *P. excelsa* dans la forêt de Beauséjour, comté de Lévis. [Effects of N and K fertilizers on plantations of *P. glauca* and *P. abies* in the Beauséjour forest, Lévis county, Quebec.] *Abstr. in Ann. ACFAS* 24, 1958 (85). [F.] L.S.

NH₄NO₃ and KCl were added to the soil in plantations of *P. glauca* and *P. abies* showing symptoms of N and K deficiency. After 2 years, growth of treated trees averaged nearly 3 times that of controls. K content of leaves, 3 months after treatment, had risen from 1500 to 4500 p.p.m. Despite the fact that, as in agricultural plants, the NH₄ ion seems to be antagonistic to the K ion, plants fertilized with NH₄NO₃ have shown excellent growth to date.

3081. HAGIN, J., KAPLAN, J., and KOLAR, M. Fertilizer application trials in young Eucalypt plantations. [Docum.] *Wkg. Party on Eucalypts* *FAO Jt. Subcomm. Medit. For. Probl.* No. *FAO/SCM/EU/12b*, 1960. pp. 3.

Trials were carried out in a young plantation of

Eucalyptus gomphocephala in the Jerusalem Corridor, with applications, per dunam, of 50 kg. (NH₄)₂SO₄, 75 kg. superphosphate, and 25 kg. KCl. The young trees responded significantly to N fertilization, but not to P or K.

238. Timber Plantation Crops requiring Special Treatment

3082. WENDT, G. Zu einigen Fragen des Pappelanbaues. [Some problems of Poplar growing.] *Forst u. Jagd* 10 (10), 1960 (467-9). [G.]

Discusses the reasons for the poor results of the Poplar planting programme. Of ca. 40 million Poplars planted in E. Germany from 1951 to 1959, ca. 50% failed or are very poor. It is hoped that the recent transfer of most of the Poplar cultivation to the state forestry unit will result in a better selection of sites and varieties, better tending and better growth.

3083. PODHORSKI, I. Aktuelni problemi plantažnog gajenja topola. [Current problems of growing Poplars in plantations.] *Topola, Beograd* No. 16, 1960 (2-9). [Serb.f.]

Discusses suitable soils, desirable types of planting stock, agricultural cultivation in plantations, yield at various ages on 4 site classes, and rotations (10-15 years is the period at present envisaged) in Yugoslavia.

24. Tending of Stands and Trees

See also No. 3967.

241. Cleanings

3084. WEISS, O. Neue Werkzeuge zur Jungbestandspflege. [New tools for tending young stands.] *Allg. Forstzeitschr.* 15 (50), 1960 (704-8). 5 refs. [G.]

Discusses the tools and combinations of tools commonly used in W. Germany for cleaning etc. Though the axe is preferred by most workers as the most versatile tool, a set of one-hand secateurs, bill-hook and tending saw is thought to be preferable in most cases. The saw developed at the Langenback (Württemberg) school for forest workers, is fitted with a slightly curved, 45-cm. blade having a short row of fine teeth near the handle and coarse teeth for the rest of its length. A special bag fixed to the belt is provided for carrying the tools.

3085. KLOTZ, K. Läuterung mit Herbiziden in den Buchendickungen des Bayerischen Waldes. [Cleaning with herbicides in the Beech thickets of the Bayerischer Wald.] *Allg. Forstzeitschr.* 16 (4), 1961 (69-71). 1 ref. [G.]

Describes trials with Tormona 100 and Forst-Anicon [2,4,5-T preparations] at 3% in diesel oil, applied by brush to marked trees in the cleaning of thickets. Both spring and autumn treatments led to death in the following summer. Costs, at DM. 75/ha., were ca. 10% of conventional cleaning costs. Unwanted Beech thickets were killed by spraying at DM. 120/ha., but to this the cost of clearing the site of the dead trees will have to be added.

242. Thinnings

See also Nos. 2713, 2940, 3224, 3457, 3479, 3967. 3086. MAGYAR, J. A V-fás allománynevelés-forradalmi változás fatermesztésünkben. [Stand treatment for end-use stems—a revolution in our timber production.] *Erdő* 9 (4), 1960 (128–38 + smries. in suppl.). 31 refs. [Hu.russ.g.]

Reports studies on the fixing of end-use stem number, the object being the attainment of a higher d.b.h. at rotation age. The importance of spacing when marking these stems for reservation, and the laying down of prescriptions for management are also demonstrated.

3087. PENISTAN, M. J. Thinning practice. *Forestry* 33 (2), 1960 (149–73). 23 refs.

The development of thinning methods in the plantations of New Zealand, Australia, and South Africa is briefly described and discussed in terms of relative spacing with reference to British practice, especially crown or free thinning. Maintenance of long crowns of at least half total height is considered essential, and until more data are available from sample plots the simple rules of the Scottish eclectic thinning method are recommended, especially where pruning is done [cf. *F.A.* 15 No. 3561]. *From author's summary.*

3088. VUOKILA, Y. Ala- ja yläharvennuksesta sekä niiden vaikutuksesta puuston kehitykseen Raution istutuskusikossa. [On low thinning and crown thinning, and their effect on development of growing stand in planted Spruce stand of Rautio.] *Commun. Inst. For. Fenn.* 52 (8), 1960. pp. 29. 26 refs. [Fi.e.e.]

Sample plots were set up in 1932 in a Spruce plantation then aged 30 years, and these have been measured 6 times, at each thinning. Both light and heavy, low and crown thinnings were applied. The results indicate that low thinnings (a) have resulted in more trees in the largest size class, a greater cubic volume in such trees, and a mean d.b.h. of the 100 largest trees 5–6% greater, than on crown-thinned plots (b). Owing to the large number of medium-sized trees produced on (b), the mean d.b.h. of trees on those plots is, however, slightly greater than that on (a) plots. Total cubic volume was higher on the (a) than on the (b) plots, but in each case less than in controls.

3089. LEHTPERE, R. The crown expansion of Japanese Larch after heavy thinning. *Forestry* 33 (2), 1960 (140–8). 5 refs.

A *Larix leptolepis* stand of quality class I/II was thinned to 50 trees/acre at 25 years. In 5 growing seasons thereafter, the mean d.b.h. increased at the rate of 5.7 annual rings per in.; the mean height increment was 3.0 ft. in 5 years; the volume increased from 457 to 700 H. ft. o.b. per acre, a rate of growth representing 8.9% at compound interest; the crown projection area occupied 21.1% of the ground at the beginning of the 5-year period and 41.3% at the end of it, an annual increase of 14.1% at compound interest. The multiple regression of the tree volume increment on (i) tree volume at the beginning of the 5-year period, (ii) increment of the crown surface

area during the period, and (iii) the crown surface area at the beginning of the period, has been calculated; the first two independent variables of this regression have significant positive regression coefficients, and the third, the crown surface area, has a negative regression coefficient which is not significant at the 5% probability level. *From author's summary.*

3090. BAMFORD, G. T., and LITTLE, S. Effects of low thinning in Atlantic White-Cedar [*Chamaecyparis thyoides*] stands. *For. Res. Note Ntheast. For. Exp. Sta.* No. 104, 1960. pp. 4. 10 refs.

Low thinnings did not appreciably increase production of merchantable timber, and did have the undesirable effect of stimulating the growth of understory hardwoods.

3091. MYERS, C. A., and DEUSEN, J. L. VAN. Natural thinning of Ponderosa Pine in the Black Hills. *J. For.* 58 (12), 1960 (962–4). 6 refs.

The effectiveness of natural and pre-commercial thinnings was compared on four $\frac{1}{10}$ -acre plots in a 63-year Ponderosa Pine stand in S. Dakota. Two plots (a) had never been thinned, (b) had been thinned to 3,280 trees/acre at age 25, and (c) to 379 trees/acre at age 40. Natural thinning was not heavy enough to put (a) in productive condition; the light thinning in (b) was little better. In (c), however, stand volume at age 63 was 16 cords/acre of pulpwood with trees averaging 6.5 in. d.b.h. The results showed that natural thinning occurs at too slow a rate, and that pre-commercial thinnings are necessary if dense young stands are to produce sawlogs on the accepted 160-year rotation, together with maximum post and pulpwood yields. Stagnated stands will respond to release until they are at least 40 years old. [Cf. *F.A.* 20 No. 1813.]

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also No. 3068.

3092. ROONWAL, M. L., CHATTERJEE, P. N., and THAPA, R. S. Results of tree-poisoning experiments on four species of Indian trees for providing anti-insect protection. *Indian For. Rec. (n.s.) Entomology* 9 (12), 1960 (215–39 + 3 plates). 3 refs. Price Rs. 3.25 (5s. 3d.).

Previous experiments having shown that girdling of trees 1–2 years before felling gives no protection against subsequent borer attack [see *F.A.* 20 No. 4569], further preliminary experiments were made to determine the effect of poisoning trees before felling. The species used were *Boswellia serrata*, *Dalbergia sissoo*, *Bombax malabaricum*, and *Shorea robusta*. The chemicals used were: (i) Na arsenite as 1 and 3% solutions in water, as a paste, and as a dust; (ii) $ZnCl_2$ as 8 and 12% suspensions in water, as pure liquid, and as paste; (iii) Na_2SiF_6 as 2 and 5% suspensions in water, as powder, and as paste; (iv) borax as 1.5 and 3% solutions in water, as powder, and as paste; (v) 6.5% γ BHC as paste; (vi) NH_4 sulphamate. The poisons were applied 30 cm. above the ground to: (a) a complete band-girdle, (b) a discontinuous girdle, (c) a full girdle, (d) two

holes drilled on opposite sides of the stem, and (e) a deep notch. Those trees that showed symptoms of poisoning were felled along with untreated controls, converted into logs, boards, and billets, and exposed for natural infection by borers. Only two of the chemicals used, (i) and (vi), proved successful both in quickly killing the trees and in giving satisfactory protection against borers. The dosages of poison per cu. ft. of stem volume at which protection was provided were: (i) 42 g. on *D. sissoo*, 15.6 g. on *S. robusta*, and 22.7 g. on *B. serrata*; (vi) as paste 28.4 g. on *S. robusta*. Of the methods of application, (a) with poison in the form of paste was found to be the most convenient.

3093. [Mapane stand improvement trial.] *Extr.* from *Jversl. Landsbosbeh., Paramaribo* 1959 (37-9, vi, + 1 photo, 2 gphs.). [D.u.e.]

[Cf. *F.A.* 20 No. 3174.] Girth increment and mortality of merchantable species of >2 cm. d.b.h. have been measured annually since 1956, and germination, height growth and mortality of seedlings since 1959. Provisional curves are given showing the effect of eliminating weed species of >5 cm. d.b.h. on diameters of *Carapa guianensis* and *Ocotea rubra*. Opening the canopy also stimulated germination of light-demanding species e.g. *Goupia glabra*, *Qualea coerulea*, *Simaruba amara*. The experimental area was enlarged in 1959.

245. Tending of Trees, Pruning etc.

See also Nos. 3118-9.

3094. [Pruning costs for *Pinus radiata*.] *Extr.* from *Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (13-4).

A time study was made to determine the cost of low-pruning of *Pinus radiata* in relation to spacing (varying from 4 × 4 to 20 × 20 ft.). As found earlier for high pruning [cf. *F.A.* 21 No. 3157] average pruning time per stem plotted against the square of the initial spacing tends to produce a straight line. A comparison of pruning times for any given spacing revealed that these were exactly proportional to the length of stem pruned. The relationship is expressed by the formula: $T = 0.0044 S^2 + 0.3186$, where T = pruning time per ft. length of stem, and S = spacing (in ft.) between trees when planted. This means that for the cost of pruning 100 trees in a stand planted at 6 × 6 ft., 133 may be pruned at 3 × 3, 71 at 9 × 9, 50 at 12 × 12 and 36 at 15 × 15, provided that the height of pruning is constant.

3095. VUOKILA, Y. Elävien oksien karsimisen vaikutuksesta männyn kasvuun. [The effect of green pruning on the growth of Scots Pine.] *Commun. Inst. For. Fenn.* 52 (1), 1960. pp. 27. 32 refs. [Fie.e.]

Green pruning was done in 4 young Scots Pine stands (25-35 years old) removing 0, 20, 50, and 80% of live-crown length, and trees were re-measured 4 years later. It is concluded that the 2-3 lowest whorls of green branches (20% of green-crown length), but not more than $\frac{1}{2}$ of green-crown length, may be removed without appreciable loss of

increment, provided that the crown ratio is not reduced below 40%.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

3096. NYE, P. H., and GREENLAND, D. J. The soil under shifting cultivation. *Tech. Commun. Bur. Soil Sci., Harpenden* No. 51, 1960. pp. viii + 156 + 16 photos. 13 pp. of refs. Price 20s.

This review is based partly on the literature and partly on the authors' own work (mainly in Ghana). Part I—*The fallow period*, contains chapters on: (1) The range of fallows and soils (in the tropics); (2) The amounts of nutrients in the fallow and soil; (3) The nutrient cycle; (4) The restoration of fertility under the fallow. Part II—*The cropping period*, has chapters on: (5) The effect of cleaning and burning; (6) The decline in fertility under cropping. Part III—*The system as a whole*, covers: (7) Fertility under native practice; (8) Retrospect and prospect.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (Auewald)

See also Nos. 2890, 3060.

3097. ALI, Z. Principles and practice of irrigation in the irrigated forest plantations of West Pakistan. *W. Pakistan For. Dep. Rec.* No. 3, 1960. pp. 249 + 8 dgms.

A comprehensive account of these plantations, with chapters on: soils; plant/soil-moisture relationships; selection of site; lay-out of a plantation; design of irrigation channels; lay-out of the irrigation system; practice of irrigation; lift irrigation.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

3098. TÓTH, B. A gátmenti fásítások szerepe, az árvédelmi töltések állagának fenntartásában. [The role of tree planting along dykes in the maintenance of high water dykes.] *Erdő* 8 (3), 1959 (109-16 + smries. in suppl.). [Hu.russ.g.]

The exposure of 17 root systems (Poplar, Willow, Robinia and Ash) in a study of their effect on the protective function of the dyke front showed that if the dyke body was dry, roots remained superficial. They extended under the dyke only where the natural soil had not been removed in construction. A safety strip 6 m. broad should be left unplanted along the dyke front.

3099. TAPAY, L. A csatornák és a kisvízfolyások fásításának kérdései. [Growing trees along canals and small watercourses.] *Erdő* 8 (3), 1959 (81-93 + smries. in suppl.). 10 refs. [Hu.russ.g.]

Contains detailed instructions for the spacing and mixing of species for different types of canal.

3100. LESZNYÁK, J. A Keleti Főcsatorna környékének nyárfásítási lehetőségei. [Possibilities of raising Poplars along the Eastern Main Canal.]

Erdö 8 (3), 1959 (98–102 + smries. in suppl.). [Hu. russ.g.]

This 98-km. canal with its included network of waterways offers 2670 ha. for Poplar planting. Special attention should be paid to soil properties, soil cultivation, and at least 2–3 years' tending of the plants. A wide spacing is important. *P. × robusta* is growing fastest at present but *P. × marilandica* and *P. nigra* may outstrip it later.

266. Shelterbelts, Windbreaks

See also Nos. 2872, 3067, 3213–4.

3101. SHEPHERD, F. W. **Trees and shrubs for shelter.** *J. R. Hort. Soc.* 85 (1), 1960 (17–27 + 3 photos). P.O.

Recommends species, both native and exotic, proved wind-resistant in trials at Rosewarne, Cornwall, for use in shelterbelts and hedges.

3102. MOONEY, O. V. **Some notes on shelterbelts in Irish coastal regions.** *Irish For.* 17 (2), 1960 (53–6).

A lecture discussing choice of species, width, siting, spacing within and between rows, etc. *Pinus radiata* and *Cupressus macrocarpa* have grown well in coastal areas, especially on dry mineral soil, and the first-named also on sand. Other recommendations for dry mineral soil include Austrian Pine, Lawson Cypress and, though comparatively untried, *Eucalyptus urnigera* and *E. johnstonii*, which are fast growing, evergreen, and wind-resistant, and have shown promise as shelter trees. For peats, *Pinus contorta* is recommended, with *P. mugo* in mixtures only, and *Picea sitchensis* only for wider belts on better peats or moist soils.

3103. BAUMANN, D. O. **Windschutz am Seedeich. [Windbreaks on sea dykes.]** *Repr. from Deutsche Landwirtschaftliche Presse, Hamburg* 1960 (44), (446). [G.] (Suppl. to *Holzzucht* 14 (5/6), 1960.)

Harff Poplars [*Populus × canadensis* cv. "Regenerata Deutschland"] planted in 1951 in a seven-row shelterbelt just inside a dyke near Emden, grew very well on the fertile polder soil, despite residual salinity and strong sea winds. A tendency to forking is attributed to broken leaders, due partly to the wind, and partly to birds perching on them, as they frequently do in this almost tree-less area.

3104. BALTAKE, R. **Shelter planting practice: Report on a tour in parts of Northern Germany and Jutland.** *Scot. For.* 15 (1), 1961 (17–32 + 5 photos). 2 refs.

3105. YEATES, J. S. **Farm shelter problems in the Manawatu Plains area.** *Farm For., Wellington* 1 (2), 1959 (31–40).

The conditions in this area, on the W. coast of North Island, include a high water table and strong, persistent, salt-laden winds. The species hitherto used in shelter planting—*Pinus radiata*, *P. muricata*,

Cupressus macrocarpa and *Eucalyptus globulus*—are all more or less unsatisfactory owing to dieback, short life, and straggling habit. Some suggestions are made for more suitable species, including Bamboos and pampas grass.

3106. BROWN, C. H. **Farm shelter for exposed rolling country of Otago.** *Farm For., Wellington* 1 (2), 1959 (41–8).

Conditions of frequent cold S.W. airstreams accompanied by gale-force winds are a feature of the winter climate of Otago. Where effective shelter has been provided, pasture growth is checked less, stock lose less condition, and feed requirements are reduced. The author discusses the factors that should be considered in the orientation and location of shelterbelts in rolling country, and suggests which tree species and shelterbelt patterns are most suited to the climatic and topographic features of the rolling country of Otago. The points about shelterbelt location and orientation are generally applicable throughout New Zealand. *From author's summary.*

3107. NIKITIN, S. A. **Zaščitnye nasaždenija stepnogo Zaural'e. [Protection stands in the Trans-Urals steppe region.]** *Soobšč. Inst. Les.* No. 8, 1957 (13–21). 15 refs. [Russ.]

A general account of the conditions, and of the tree and shrub species used and their growth. The shelterbelts are part of the plan of opening up the "virgin lands" of the U.S.S.R.

3108. TANAKA, S., TANIZAWA, T., and KAKI-NUMA, S. **[Studies on the preventive function of woodbelts against frost damage. (3). Frost belts.]** *Journal of Agricultural Meteorology, Tokyo* 15 (2), 1959 (46–8). 2 refs. [Jap.e.e.] L.S.

Cold air currents flowing down through zones of severe frost damage in a foothill district in Tochigi, warmed up when entering conifer stands. Temperatures near the ground for two spring days are given as 4.5 and –2.0° C. on grass, and 5.4 and –0.2° in a deciduous stand vs. 7–8 and 2.1° in a stand of Japanese Cedar [unspecified], with similar differences at 1 m. from the ground. Marked temperature differences were found, particularly at ground level, between a grass plot situated upwind from a conifer belt and another downwind.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 2806, 3124, 3232, 3244–6.

3109. BLANFORD, R. H. **Spring treatment as an aid in controlling chamise [*Adenostoma fasciculatum*].** *Range Impr. Stud. Calif. Div. For.* No. 3, 1960. pp. 6. 2 refs.

On plots of chamise in Shasta County, cut or burned in May or June, sprouts grew rapidly, but began to die in October; by the following summer, >75% of plants were dead. On plots treated in other months, the sprouts continued to grow. The difference in survival was very evident 5 years later. [Cf. *F.A.* 21 No. 1953.]

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 2876.

3110. MITCHELL, A. F. Notes on some arboreta in Scotland. 1. Taymouth Castle Gardens, Kenmore, Perthshire. *Scot. For.* 15 (1), 1961 (3-7).

3111. GERLING, J. What—and why—are patented trees. *Amer. Nurserym.* 112 (12), 1960 (9-10, 69).

Some desirable features for patented trees are consistent growth habit suited to some particular use, comparatively small ultimate size, lack of fruits, etc.

3112. PRJAHIN, M. I. Pal'my v Leninabade. [Palms in Leninabad.] *Bot. Zh.* 45 (5), 1960 (710-2). [Russ.]

A short account of the performance of *Trachycarpus excelsa*, *T. fortunei*, *Chamaecrops humilis*, *Sabal adansonii*, *Washingtonia filifera*, *Phoenix canariensis* and *P. dactylifera* grown outdoors in Leninabad, Uzbekistan. [Cf. *F.A.* 16 No. 3830.]

3113. WYMAN, D. Widely recognized as most graceful of conifers, Hemlock species few. *Amer. Nurserym.* 112 (11), 1960 (12-3, 48-9).

Lists 16 recommended ornamental species and varieties of *Tsuga*, 9 recommended varieties of Douglas Fir, and a number of varieties of *Tsuga canadensis* not recommended. Neither *Pseudotsuga sinensis* nor *P. japonica* is recommended.

3114. WYMAN, D. Sorting the woody ornamentals: graceful Birches popular despite pests and short life. *Amer. Nurserym.* 113 (3), 1961 (20-1, 65...72).

Lists 14 recommended species and varieties and 70 not recommended, native and exotic.

3115. WYMAN, D. Majestic Beech requires space to display beauty. *Amer. Nurserym.* 113 (1), 1961 (16-7, 112-3).

Describes *Fagus grandifolia*, *F. sylvatica* and 11 varieties of the latter, recommended for ornamental use but not for street planting, and lists 25 species and varieties to be avoided.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

3116. NAGY, A. A karacsonyfanevelés. [Growing Christmas trees.] *Erdő* 9 (5), 1960 (199-200 + smries. in suppl.). [Hu.russ.g.]

Two-year transplants of Norway Spruce should be set with due care for the characteristically horizontal spread of their roots. The area should be kept weeded for the proper development of the lower whorls. Soil moisture should be conserved by frequent shallow hoeing. N fertilizer has a very favourable effect on quality.

3117. NEUBACHER, F. Die grosse Ernte einer im Jahre 1953 errichteten Weihnachtsbaumkultur unter zwei Starkstromleitungen. [High yields from a Christmas-tree cultivation established in 1953 under

two power lines.] *Int. Holzmarkt* 52 (1), 1961 (14-5). [G.]

Stems of Spruce were shortened by an almost horizontal cut to $\frac{3}{4}$ of their length. One to four branches, the number increasing with tree vigour and site quality, were left to grow on for future cutting as Christmas trees, the remainder being shortened to reduce competition. Each tree should, during its normal life, produce 10-15 Christmas trees. The method is very profitable and particularly suited for clearings under cables, etc.

3118. MILLER, W. E., and ARND, J. L. European Pine shoot moth damage reduced on sheared Christmas trees. *Tech. Note Lake St. For. Exp. Sta.* No. 592, 1960. pp. 2. 1 ref.

Studies on *Pinus sylvestris*, *P. nigra*, and *P. resinosa* in Lower Michigan showed that *Rhyacionia buoliana* damage can be greatly reduced by clipping the tips of the new Pine shoots after late June. A mean of $\sim 3-4\%$ of the bud clusters developing on these clipped shoots was infested and destroyed. The treatment also halved the number of insects per tree, though this reduction is not enough for adequate control. These findings explain the reduction in *R. buoliana* infestations noted in Christmas-tree Pine plantations regularly sheared for shaping.

3119. DUNCAN, D. P., SULLIVAN, E. T., and SHUE, C. J. Effect of time of shearing Red Pine [*Pinus resinosa*] Christmas trees on bud formation and leader growth. *Minn. For. Note* No. 96, 1960. pp. 2.

[Cf. *F.A.* 20 No. 1839.] Data for a single year's shearing of Red Pine in Minnesota indicate that shearing in early August appreciably reduces the length, width, and number of terminal buds when compared with shearings 2 and 4 weeks earlier.

282. Bark Crops

See also No. 3877.

3120. Wattle shelterwood experiments. *Rep. Wattle Res. Inst. S. Afr.* 1959/60, 1960 (20 1 + 2 photos).

In two experiments in which (1) nurse trees at different densities were stripped, (2) fire-killed Wattle were left standing over young regeneration, it was found that no frost damage occurred even in plots with the fewest nurse trees (60/acre), whereas well grown regeneration in an adjoining plantation suffered severe frost damage after the felling of overwood trees. It is therefore recommended that before stripping Wattle plantations in areas known to be subject to severe frosts, ca. 100 well-distributed, large-crowned dominants per acre should be selected and stripped standing to act as nurses for the regeneration of the crop when the rest of the stand is felled.

3121. BEARD, J. S. Results of experiments on width of row in Wattle silviculture. *J. S. Afr. For. Ass.* No. 35, 1960 (10-1).

Replicated plots giving similar final number of stems per acre showed that 6, 9, or 12 ft. between

rows gave similar bark yields. For working convenience, and because tasks are measured along the line, the widest spacing is best. At 15 ft., smaller diameters and lower bark yields were obtained. The final stems proved to be elliptical, the major diam. lying along the contour and (surprisingly) along the row. Where these coincided, the major axis exceeded the minor by 0.2 in. (ca. 3%). Where rows ran downhill the effect was cancelled.

3122. CILIBERTO, L. Perspectivas para el cultivo del alcornoque en la República Argentina. [Prospects of Cork Oak cultivation in Argentina.] *Idia* No. 150, 1960 (67-74). [Span.] C.G.B.

Presents short notes on the species, the history of the cork industry, the economics of its cultivation, and on consumption and imports of cork in Argentina, and discusses the possibilities of Argentine production of cork.

3123. RODRIGUES, J. FELIZ, and PONTE, M. BARREIRA DA. Repovoamento e recuperação de solos de montados de sobreiro. [Reforestation and rehabilitation of the soils of Cork Oak stands.] *Bol. Junta nac. Cortiça, Lisboa* No. 264, 1960 (303-15, lxxi-vi, 75-81). [Port.E.F.]

The main cork-growing areas of Portugal are roughly as follows: (1) ca. 26% in the Upper Alentejo, where the chief soils are (a) non-calcareous brown soils, and (b) lithosolic non-calcareous brown soils; (a) have a high productive capacity, but (b) are frequently impoverished, being subjected to a rigorous system of cereal cropping, with consequent regression of the Cork Oak; (2) ca. 47% in the areas in the basin of the river Sado and on the left bank of the Tagus, on sandstones and podzolized sandy soils; where there is good drainage and the soil is able to retain sufficient moisture in dry weather, growth is good, but where there are drainage and erosion problems the stands are regressing; (3) 17% in the zone of carboniferous schists limited on the north by the basin of the river Sado, and in the south by the Algarve mountains; the majority of these soils can be classified as non-calcareous brown and brown lithosolic soils derived from clay schists; here impoverishment of the soils and drought are the main factors limiting the growth of Cork Oak and other vegetation. Experiments are described in contour bunding on the unsatisfactory soil types (except on the well drained podzolized sands, where the addition of fertilizers only is recommended), with direct sowing of Cork Oak along the trenches. Measurements of soil moisture on treated and untreated slopes showed that at a depth of 30 cm. the increase in moisture on treated slopes is considerable. It was found that the best sowing position was at a height of $\frac{1}{3}$ from the base of the mound. Some recommendations are also made for growing and managing pasture on sites so prepared.

3124. MORAIS, A. DUARTE. Acerca do enterramento do mato dos sobreiros, sua influência no solo e na pastagem. [Turning in the ground cover of Cork Oak stands, its influence on the soil and on the forage.] *Estud. Inform. Serv. Flor. Açúic. Portugal* No. 122-C3, 1960. pp. 34. 16 refs. [Port.] Limited distribution.

A comparison was made in a Cork Oak stand, fallow for 9 years, of the effects of (1) an ordinary ploughing and removal of ground cover (early Jan. 1957), and (2) turning in the ground cover by means of a rotavator (late Dec. 1956). In Nov. 1957 both plots were sown with barley, some chemical fertilizer being added. After harvesting the barley, a count was made of species on both plots, and the state of the soils and forage value of the vegetation were studied. Both soils were poor in N and P and deficient in K, but (2) had more of these elements than (1) and a higher content of organic matter and moisture. The (already acid) soil was more acid in (2). In both plots, but more in (2), the acidity had a somewhat adverse effect on the mineralization and fixation of N. The C/N ratio of the horizon examined was the same on both plots, i.e. 24. There were more species in the ground cover of (2) than (1), but the common species were normally abundant in both. Less forage was produced on (1), and, unlike (2), it was deficient in proteins. It can be concluded that, except for the increased acidity, soil conditions were better in (2), and the forage value greater.

283. Fruit and Seed Crops etc.

See also No. 2932.

3125. Natural Palm groves: Palm grove improvement. *Extr. from Rep. W. Afr. Inst. Oil Palm Res. 1959/60*, 1960 (75-81).

Reviews experiments in the improvement of natural groves of Oil Palms (largely in E. Nigeria) by fertilizing, thinning, enrichment by planting with superior forms, and increasing the length of fallows.

3126. DŽIAUKŠTAS, P. Lazdyno panaudojimo klausimu. [Utilization of Hazel [*Corylus avellana*].] *Liet. Miškų Ūkio Moksl. Tyr. Inst. moksl.-tech. inform. Biul.* No. 1, 1959 (19-21). [Lith.]

Hazel is widely distributed in Lithuania, growing up to 10 m. high, 18 cm. in diam. at 1 m. from the ground, and 1300 trees/ha., but despite its many merits—providing valuable shelter, soil improvement, wickerwork, nuts—its culture is neglected. The author estimates a nut yield of 235 kg./ha. and a total of 10,000 metric tons p.a. from existing stands under proper management. He distinguishes 11 varieties, based on leaf morphology and dimensions of kernel and shell; the variety having a reddish 'cup' round the nut is the best yielder. Notes on nursery propagation, including layering, and tending are given.

284. Crops Tapped for Exudations etc.

See also Nos. 3563, 3819.

3127. BOJANIN, S. O utrošku vremena kod radova na smolarenju i određivanju troškova radne snage. [Time consumption and calculation of labour costs in resin-tapping.] *Šum. List* 84 (9/10), 1960 (292-306). 23 refs. [Croat.e.]

Gives results of a time study covering all the operations of resin-tapping (using French faces) in a 60-year stand (10% *Pinus sylvestris*, 90% *P. nigra*) in its 4th year of tapping on a level site at Đurdevac, N. Croatia. All timings are tabulated for a whole

season in terms of work on one face, for stems carrying one, 2, 3 and 4 faces. At a mean stocking of 208 tapped trees per ha., ca. 24% of the total time was spent simply in going from tree to tree. In the light of the results, it is recommended that wages be determined according to weight of resin produced, the rate paid per kg. being calculated separately for each month according to resin flow.

3128. AL'BIN, E. S. Himičeskij hak dlja nanesenija podnovok na vysokih karrah. [A hack for freshening on high faces.] *Gidrol. lesohim. Prom.* 13 (8), 1960 (20). [Russ.] P.R.

Describes and illustrates the hack, designed by A. I. Syčev, which is used for freshening (with application of H_2SO_4 paste) faces at heights ≥ 3 m.

3129. KOSTOV, P. Izučvanija vārhu smolo-produktivnostta na černija bor (*Pinus nigricans* Host.). [Studies on the resin yield of *P. nigra* var. *austriaca*.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (205-19). 10 refs. [Bulg.]

Discusses and tabulates some of the results of tapping trials in 1953-56 using the French face, on 784 stems aged 35-85 years. Increasing the face width from 5 to 14 cm. (by 1-cm. intervals), and increasing the depth from 0.5 to 1 cm. both increased mean resin yield per tree. Increasing the depth to 2 cm. did not increase resin yield per freshening, and actually reduced resin yield per sq. cm. of face; freshening depth should therefore remain at 1 cm. Generally, resin yields per freshening increased with the freshening interval (3, 4 and 5 days), but total yield per tree decreased. More than 50% of all resin flow occurred in the first 24 hours; and flow practically ceased after 48 hours.

3130. ORLOV, I. I. Ob ob'emom nagruzke i koeficiente vozdejstviya pri podsočke sosny. [Tapping intensity and the "coefficient of influence" in tapping Scots Pine.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (164-8). [Russ.]

[Cf. F.A. 22 No. 569.] Discusses two ways of estimating tapping intensity—the conventional linear method (expressing intensity as the ratio of the tapped part of the girth to the whole girth), and a new volumetric method (expressing intensity as the amount of sapwood removed from the tree per season, V , in c.c.). The "coefficient of influence", K , is V/N , where N is the thickness of the sapwood, in cm. The use of the volumetric expression and the coefficient is thought to be a better method of determining freshening depth and face length and width, in relation to the biology of the Pine. This is especially important in prolonged tapping (≥ 10 years) so as to ensure sustained resin yields.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

3135. HILF, H. H. Rationalisierung der Forstarbeit—Möglichkeiten und Auswirkungen. [Rationalization of work in forestry—possibilities and effects.] *Forst- u. Holzw.* 15 (22; 23), 1960 (469-75; 489-91). 38 refs. [G.]

3131. DANILOV, M. D., and PČELIN, V. I. Opyt prižiznennogo ispol'zovanija bereskleta boro-davčatogo. [Trials in utilizing *Euonymus verrucosus* without killing the plant.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (29-33). [Russ.]

On the basis of trials covering several years, recommends cutting and pulling out only those roots that are of commercial size, leaving the rest of the plant alive so as to produce new roots quickly.

3132. SHENEMAN, J. M., and COSTILOW, R. N. Identification of microorganisms from Maple tree tapholes. *Food Research, Champaign, Ill.* 24 (1), 1959 (146-51). 13 refs. N.L.L.

Both bacteria and yeast populations were found to develop to fairly high levels during the sap season in 1955-56. Numbers of moulds were relatively low and they occurred almost entirely early in the season. The chief species or genera of the micro-organisms found are listed.

3133. SHENEMAN, J. M., et al. Correlation between microbial populations and sap yields from Maple trees. *Food Research, Champaign, Ill.* 24 (1), 1959 (152-9). 6 refs. N.L.L.

[Cf. F.A. 19 No. 1778.] A three-year study, using sufficient material to permit statistical analysis, showed a high degree of correlation between the occurrence of high yields of bacteria early in the sap season and low yields of sap. Inoculation studies with a number of species of bacteria and yeasts and one mould culture, showed that any organism capable of growing in the environment would result in stoppage of sap flow, probably by physical blocking of the vessels. The insertion of a pellet containing formaldehyde into the tap-hole was the most promising of a number of methods tested for controlling micro-organisms, but insufficient data are available on the elimination of the formaldehyde from the sap, during conversion to syrup, to allow conclusions to be drawn as to the value of the method.

286. Osier-Growing

3134. TOMPA, K. A fűzveszözötermesztés néhány kutatási eredménye. [Some research data on basket Willow production.] *Erdő* 9 (3), 1960 (108-16 + smries. in suppl.). 6 refs. [Hu.russ.g.]

Gives production data for various varieties, races and hybrids of *Salix viminalis*, *S. triandra*, *S. alba*, *S. fragilis*, *S. purpurea*, etc. and recommends a spacing of 60 × 12 cm. for stripped wands, 60 × 20 for heavy production of green withes and 60 × 30 for the races used for rods.

3136. HILF, H. [H.] Bad Münster am Stein 1960. Ergebnisse der Fachtagung der Gesellschaft für forstliche Arbeitswissenschaft (GEFFA) e. V. Tagungsbericht in Form eines Sammelreferats. [Bad Münster am Stein 1960. Results of the technical meeting of the Society for Forest Work Science

(GEFFA). Meeting report in review form.] *Forst-archiv* 31 (11/12), 1960 (205-16). 75 refs.

The meeting examined the rationalization of forest work and its effect on costs. A bibliography is given listing literature on this and previous meetings, and articles relevant to the meeting's theme published in German in 1959-60.

302. Man and Work (Physiology and Psychology)

3137. SUNDBERG, U. *Ergonomics in forestry.* *Forestry* 33 (2), 1960 (131-9).

Briefly considers the changes that might improve safety, health, comfort, and efficiency, and examines the simple physiological methods involving measurement of pulse beat developed by N. Lundgren in the study of heavy and complex work such as forest work. For less complex work, more precise methods such as the measurement of O intake can be adopted. The moot question of whether heavy work has in the long run any ill effect on health and working capacity is discussed. *From author's summary.*

304. Hygiene. Safety. Accidents and their Prevention

See also No. 3137.

3138. A directory of organizations concerned with forest workers' safety. [Publ.] FAO/ECE Jt. Comm. Working Tech. No. FAO/ECE/LOG 70, 1960. [E.]

The publication, material for which was derived from a questionnaire, is produced in loose-leaf form, with separate pagination for each of the 21 contributing countries.

305. Sequence of Work and Performance

See Nos. 3023, 3127.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 2945-7, 2978, 2995, 3049, 3084, 3128, 3215.

3139. Driftsteknisk rapport fra Det norske Skogforsøksvesen. [Report on working techniques by Det norske Skogforsøksvesen.] *Tidsskr. Skogbr.* 68 (4), 1960 (225-313). [Nor.]

Comprises 14 preliminary reports by I. Samset, C. F. Lindeman, S. Rosseland, R. Strømnes and E. Jachwitz, based on results of the first year's work at the Hurdal research forest. Subjects covered include: the use of hand and tractor winches in skidding; studies on snow in 1960; skidding with different tractors; barking with a spud; tests of bow-saw blades; and test of the Partner power saw.

31. Logging and Transport: General

3140. POBLACION, G. *Logging in the Philippines.* *Filipino For.* 11, 1959 (89-106).

A general account.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

See also Nos. 3156, 3813, 3837.

3141. BELTRAM, V. Sječa bukve krajem augusta. [Felling Beech in late August.] *Nar. Šumar, Sarajevo* 14 (3/4), 1960 (103-14). 8 refs. [Croat.g.]

In Slovenia, Croatia, and Bosnia, it has been the practice for centuries to fell Beech between 15th August and 8th September, and leave the trees untrimmed on the ground until the leaves wither. It was noted that this gave an attractive white wood, some 20% lighter than winter-felled Beech, checking little, and providing excellent fuel. Experimental investigations on several sample batches of 10 stems in 3 localities supported these observations. In open and dry situations, (a) late August fellings had lost ca. 200 kg./cu. m. after 15-20 days, and in damp, shaded valleys 130 kg./cu. m. after 30-40; (b) winter fellings lost much less weight. Checking was 50% less in (a) than in (b). Tests on 9 batches of (a) cut at the new or the full moon showed that, contrary to popular supposition, the moon's phase had no effect on rate of drying. [Cf. F.A. 20 Nos. 1869-70.]

3142. SCHÜTT, C. *Chemical debarking of trees: a review of literature.* *Pap. ja Puu* 42 (11), 1960 (579-98). 134 refs. [E.e.fi.] P.R.

Subjects covered include: natural adhesion of bark to wood, in relation to chemical barking; time of treatment, methods, chemicals, and barking of various tree species; effects of chemical barking on the tree, on wood, on pulping and pulp, and on wildlife; economics; and patents.

323. Felling and Subsequent Primary Conversion

See also Nos. 3151-61.

3143. SAŽIN, S. N. Novaja tehnologija leso-sečnihykh rabot s sohraneniem podrosta. [A new logging technique which preserves advance growth.] *Lesn. Prom.* 1961 (1), (3-7). [Russ.]

Describes in detail, with illustrations, a method of mechanized clear felling developed in the Kostroma region, which ensures maximum preservation of advance growth. After the skidding trails are cut and cleared, the tractors do not move off them; single supporting trees are felled at right angles to the general felling direction [cf. F.A. 21 No. 1853], and then the other trees are felled so as to fall over them, with their tops on the skidding trail. In this way the butts lie on the stems of the supporting trees and the tops on the trails. Survival of advance growth was 50-70% by this method, and logging output per shift rose.

3144. KOČEGAROV, V. G., and FEDJAEV, L. G. Issledovanie valki derev'ev s primeneniem stupenčatogo propila. [Investigations on felling trees by sawing them at two levels.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (63-9). [Russ.]

Describes a sawing device being developed as a component of 'universal' logging machines [cf. F.A. 19 No. 3034]. This sets three chain-saws in line so as to saw into the standing tree with the leading end of the guide-plate. The middle guide-plate is

set lower than the other two, so cutting a horizontal kerf through the tree some 5 cm. lower than those cut by the two flanking saws. The tree can then be felled under control by winching it down directly on to the logging machine. The influence of various kerf patterns on the strength of the standing tree is discussed, the optimum specifications, as determined by tests, being given.

326. Sequence of Operations

See also Nos. 3158, 3160.

3145. BEGLEY, C. D., and HOWELL, R. Air seasoning softwoods at stump. *Forestry* 33 (2), 1960 (187-202). 6 refs.

A brief statistical analysis of some practical results obtained from an experiment carried out with Sitka Spruce thinnings between 1952 and 1957 [cf. *F.A.* 17 No. 4008]. Some savings in extraction costs can be expected from reduction in weight. While there are differences in the rate of seasoning with different seasons of felling and between peeled and unpeeled poles, seasoning causes no serious deterioration in the quality of the timber for use as pit props or boxwood. *Authors' summary.*

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 3192, 3715.

3146. OLIN, D. H. Quantity of woods waste and harvesting methods. *Res. Note West. Pine Ass.* No. 7. 111, 1948 (rev. 1959). pp. 9.

From a study of the logging operations of 9 lumber companies, the quantity of waste per 1000 bd. ft. timber is estimated for Ponderosa Pine stands (25 cu. ft.), mixed Sugar Pine/Ponderosa Pine (34 cu. ft.), and mixed conifers (10-75 cu. ft.). Figures for stem and branch bark % are given. Methods and costs of harvesting woods waste, particularly by using portable chippers or brush hogs at a central point on the site, are discussed.

3147. RADICS, L. Kaposvár környéki tuskórobantási tapasztalatok. [Experience in stump blasting near Kaposvár.] *Erdő* 8 (8), 1959 (311-3 + smries. in suppl.). [Hu.russ.g.]

For best results, recommends electrical ignition and Paxit explosive, with 3-6 holes drilled at stump

base. For each stump $\frac{d^3}{2.8}$ g. of Paxit are required,

d being the diam. of stump in cm. The reaction of Oaks, Beech, Hornbeam, Lime and Elm and the effect of low temperatures are noted.

3148. JUKNA, A. D., BAŠKO, JU. JA., and IEVINŠ, I. K. Primenenie sučevykh blokov v stroitel'stve. [The use of "branchwood blocks" in building.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (117-22). [Russ.russ.] N.L.L.

Describes building blocks made of waste branches etc. [see Latvia, *F.A.* 21 p. 687], their impregnation, and an experimental building made of them. The compression strength of the blocks (in the direction

of the branches) is 12-21 kg./sq. cm., and their density is ca. 650 kg./cu. m.

3149. IEVINŠ, I. K. O zagotovke lesosečnyh othodov. [Utilizing the slash on felling areas.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (131-7). 15 refs. [Russ.russ.] N.L.L.

Describes the modified hay-baler used for making branchwood-blocks [see preceding abstr.], and gives some of the specifications of a machine now being prepared for serial production. This, the PLO-5 wire-tying ram baler, presses the cut branchwood into a bale chamber of 44 × 35 cm. cross-section, at a rate of 40 working cycles/min. The working pressure exerted is 5-7 kg./sq. cm., and the field output is calculated at 25 cu. m./8-hour shift.

34. Storage of Wood in the Forest and at Log Dumps ("Landings")

See also Nos. 3751, 3804.

3150. HEISKANEN, V. Halkojen varastoinnista. [Storing fuelwood.] *Metsät. Aikak.* 1960 (12), (443-5, 448). 4 refs. [Fi.e.e.]

Recommended methods of storage in the forest and at the roadside are illustrated.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See Nos. 3153, 3183-4.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 3084, 3149, 3161, 3192.

3151. HARITONOV, V. V. Teorija processa okorki drevesiny na koroobdoročnyh stankah. [Theory of the process of bark removal in barking machines.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (77-82 + 2 photos). [Russ.]

A theoretical and experimental analysis of the shearing of bark from the wood in barking machines.

3152. HUNT, D. L. Log barking and barkers. *Res. Note West. Pine Ass.* No. 5. 1211, 1951 (rev. 1960). pp. 12.

Discusses, with tables of costs for two installations, the economic advantages of barking logs before sawing, and describes the following barkers: Hansel Ring Barker; Hansel Arm Barker; Hansel Trunnion Barker; Simons Barker; Bellingham Barker; Nicholson Roto Barker; Burnt River Mechanical Barker; Soderhamn Cambio Barker; Mullis Log Skinner.

3153. HAJDÚ, I. A fakitermelésben dolgozók teljesítményének és keresetének emelkedése a Baltonfelvidéki Erdőgazdaságban. [Increase in performance and in labour reward in logging in the Balatonfelvidek.] *Erdő* 8 (6), 1959 (230-3 + smries. in suppl.). [Hu.russ.g.]

Illustrates graphically the extraordinary advantages of the raker-toothed cross-cut saw. Felling is done with half the men, the profit shared is nearly doubled, the smaller force is easier to train and to manage, and waste is reduced.

3154. STREHLKE, B., and PEINE, J. Erprobung der Wright-Motorfuchsschwanzsäge. [Tests with the Wright reciprocating power saw.] *Allg. Forst-zeitschr.* 15 (48), 1960 (680-1). 3 refs. [G.]

In tests at Hann. Münden, the Wright portable model GS 5020A, whose blade moves a distance of 3.8 cm. 166 times a second, cutting on the forward and raking on the backward stroke, worked about half as fast as a "Solo" chain saw on diameters of 10 cm., and only ca. one-third as fast on larger diameters (30 cm. for Spruce, 20 for Beech). Its advantages (ease of maintenance, greater safety, cheaper running cost per hour, smaller kerf and smoother cut) should, however, make it a suitable, versatile tool for estates with small woodlands, carpenters shops etc., i.e. wherever its slower performance does not matter much.

3155. VORONITSIN [VORONICYN], K. I. Improvements to petrol driven power saws in the USSR. *Publ. FAO/ECE Jt. Comm. Working Tech. No. FAO/ECE/LOG/73*, 1960. pp. 9.

Describes the results of work carried out in the U.S.S.R. to improve the design of the Družba-60 petrol-driven power-saw, particularly with the object of reducing noise, vibration, and the escape of exhaust gases [cf. *F.A.* 21 No. 534].

3156. MEŠKALLO, V. M. Upor k benzopile dlja kol'cevanija listvennicy. [A rest for power-saws used in girdling Larch.] *Lesn. Prom.* 1960 (12), (8-10). [Russ.]

Describes and illustrates the star-wheel rest, an attachment for Družba power saws which facilitates the girdling of standing Larch (to accelerate drying before felling and floating).

3157. HOLSTEIN, F. Motorsägeneinsatz im Süntelwald. [The use of power saws in the Süntelwald.] *Forst- u. Holzw.* 16 (3), 1961 (73-4). [G.]

Presents data on costs of logging and conversion of Beech [dimensions not stated] with management-owned power saws. Costs were less and hourly earnings higher than they would have been for manual work according to the loggers' tariff in force.

3158. FİLA, J. A gépi fakitermelés fokokázának lehetőségei a Mátrai Erdőgazdaságban. [The possibilities of increasing mechanization in logging in the Matra Mts.] *Erdő* 8 (7), 1959 (241-5 + smries. in suppl.). [Hu.russ.g.]

Full mechanization of felling, involving the 10 months' employment of 24 gangs with 15 one-man and 9 two-man power saws, dealing with 104,254 cu. m., allowed of pay and premium adjustments showing a 140% increase over mean rates per hour for hand work. There were 2 reserve saws for every 3 on the job.

3159. NOVIKOV, P. A. Soprotivlenie dviženiju petlevoj sučkorezki. [Resistance to the movement of a loop branch-trimmer.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (74-84). 1 ref. [Russ.]

Graphs and tabulates data on the resistance encountered in pulling stems through the trimmer [see *F.A.* 19 No. 1808].

3160. CZEREYSKI, K. Możliwości zastosowania metody obalania drzew z korzeniami. [Possibilities in the application of the method of felling trees with their roots.] *Las Polski* 34 (20), 1960 (1-3). 1 ref. [Pol.]

Describes, with diagrams, four methods of organizing the felling, transport to landings, and primary conversion (i.e. removal of crowns and roots, and sawing into assortments) of whole trees felled by a technique already described [see *F.A.* 22 No. 1924].

372/377. Land Transport

See also Nos. 3464, 3513, 3960.

3161. VINOGOROV, G. K. Nužny li agregatnye mašiny? [Are multi-purpose timber-harvesting machines necessary?] *Lesn. Prom.* 1961 (1), (13-7). [Russ.]

These machines are defined as "machines designed to carry out two or more operations, and having special non-detachable equipment to carry out each operation." The 21 different Soviet models designed since 1951 are divided into five main types: felling-cum-skidding machines (8 different models), felling-cum-loading machines (4), felling-cum-transporting machines (3), loading-cum-transporting machines (2), and skidding-cum-transporting machines (4). A table shows the basis (lorry, tractor, etc.) of each machine, its designer, the operations it can carry out, and the stage of development reached. Only one, the LK-4 loading-cum-transporting machine, has reached series production, all the others being either still experimental or not yet off the drawing-boards. Formulae for calculating the performance of the five main types of machine are presented, and some time-study data are compared with those for conventional logging methods. All the machines have disadvantages in amount of metal used, power consumption, and tare, while some of them are unsatisfactory in other respects also, and it is thought that future development of multi-purpose machines will not give satisfactory results, at least until special equipment (sawing devices, load-forming mechanisms, etc.) is designed. The conclusion is reached that the best way towards complete mechanization of logging at the present time lies in the creation of specialized machines to do only one job. On this basis the simplest mechanized system would comprise a felling machine (to saw through the tree and fell it in the required direction), a bundle-forming machine (e.g. of the bulldozer type), and a conventional skidding tractor.

3162. SAMSET, I. Ground skidding with single- and double-drum winches. *Pulp Paper Mag. Can.* 62 (2), 1961 (102-4).

Describes and illustrates seven methods of ground and high-lead skidding as used in Norway, with data on equipment and rates of work. [Cf. *F.A.* 17 No. 2876.]

3163. RAHMANOV, S. I. K voprosu o režime raboty trelevočnyh lebedok. [The working regime of skidding winches.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (62-8). [Russ.]

A theoretical study of the resistance to movement in high-lead skidding.

3164. KATAEVA, E. I., *et al.* Vybor trosobločnyh ustanovok dlja gornoj trelevki. [Selection of cable systems for mountain skidding.] *Lesn. Prom.* 1960 (12), (12-4). [Russ.]

Compares in a graph the costs of 8 different kinds of cable logging in the Carpathians with those of horse skidding. The latter is the cheapest method for volumes of timber up to ca. 1000 cu. m., and the most expensive for volumes >ca. 3500 cu. m.

3165. MAZURENKO, A. P. Rasčet dliny sobira-juščego trosu pri traktornoj trelevke. [Calculating the length of the collecting cable in tractor skidding.] *Lesn. Prom.* 1960 (12), (10-1). [Russ.]

Presents an expression for determining H , the optimum strip width for tractor-skidding tree-length logs in clear felling, viz. $2l + S$, where l is the free length of the choker, and S the mean distance between the trees; and also an expression for calculating L , the correct length of the collecting cable, viz. S^2n/H , where n is the number of stems per tractor load.

3166. Timber logging by winches with continuous cable movement. *Transl. For. Timb. Bur. Aust.* No. 50, [n.d.]. pp. 5 + 4 drawings. Transl. from *Lesn. Prom.* 1957 (5), (8-10). Limited distribution. [See *F.A.* 19 No. 4269.]

3167. RAHMANOV, S. I. K voprosu o rasčete trelevočnyh mačt. [Calculation of [the necessary strength and dimensions of] skidding spars.] *Lesn. Ž.*, *Arhangel'sk* 2 (5), 1959 (62-9). 1 ref. [Russ.]

A mathematical analysis.

3168. PESTAL, E. Seilbahnen und Seilkrane für Holz- und Materialtransport. [Cableways and skyline cranes for the transport of wood and materials.] Georg Fromme & Co., Vienna. 1961. pp. xiii + 544 + 4 dgm. 9 pp. of refs. [G.] Price DM. 52.50. E.F.A.

An illustrated manual, designed for the practical engineer, in four parts: Methods and use (of the various types); Equipment and construction materials (cables, carriages, motors, and winches, tensioning tools, timber for supports, etc.); Planning and calculations (alignment, lay-out, costing of erection and operation); and Erection (supports, anchorages, terminals etc.); there is an appendix of useful tables.

3169. CRAMB, J. Extraction by cableways and winches. *Scot. For.* 15 (1), 1961 (11-6 + 2 photos).

Brief notes on: the use of a gravity cableway, the Auto-Mower portable powered winch, and the Wyssen Cableway; care and strength of wire ropes and commonly used knots; ground anchors.

3170. BENNETT, W. D. Cableway systems for pulpwood transport. *Woodl. Res. Index Publ. Pap. Res. Inst. Can.* No. 119, 1960. pp. 71. 82 refs.

Describes, on the basis of world literature, the better known cableway systems, and attempts to evaluate their possibilities in the transport of pulpwood in Canada. The Lasso and Wyssen systems

are, in general, unsuitable for use in E. Canada, and it is thought that cableway systems will be more attractive in pulpwood harvesting when the designs and auxiliary equipment approximate more closely to the requirements set by the product.

3171. LLOYD, A. H. Recent developments in timber extraction by Skyline Cranes. *Emp. For. Rev.* 39 (4), 1960 (417-21). 1 ref.

Describes recent improvements in the Wyssen Skyline Crane. New types carrying 5-ton loads are now in operation in many parts of the world, and short descriptions are given of operations in Europe, India, and British Columbia.

3172. JAHN, F. Hosszúpályás, drótköteles kiszállítás a Bükk hegységben. [Timber extraction with cable crane in the Bükk mountains.] *Erdő* 9 (6), 1960 (223-31 + smries. in suppl.). 1 ref. [Hu.russ.g.]

Describes the construction and working of a cable crane capable of carrying a payload of 1 ton a distance of 1380 m. with a fall of 480 m. With a 4-gear, 14-h.p. diesel it can carry 16-18 cu. m. over 1100 m. in 8 hours; with a 20-h.p. motor, 24-26 cu. m.

3173. HERMAN, F. R. A test of skyline cable logging on steep slopes—a progress report. *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 53, 1960. pp. 17. 6 refs.

Describes tests with a Wyssen installation in the Fraser Experimental Forest, Colorado, and suggests some desirable improvements for American conditions.

3174. VORONITSIN [VORONICYN], K. I., and GORBACHEVSKY [GORBAČEVSKIJ], V. A. Timber transport on snow and ice roads. [Publ.] *FAO/ECE Jt. Comm. Working Tech.* No. FAO/ECE/LOG/72, 1960. pp. 9.

Describes the technique of using single-runner sledges on snow and ice roads in the U.S.S.R., including the construction and maintenance of such roads.

3175. LEVANTO, S. Uusi tukinjountolaite kokeiltavana. [A new device for dragging timber.] *Teho, Helsinki* 1960 (9), (457-9). [Fi.]

A small two-wheeled carriage (illustrated) with a pair of shafts, and tongs mounted on a cross-bar that can be raised to a position where the end of the log is lifted clear of the ground.

3176. ANDERSSON, A. Kombinierte Geräte für die Rückarbeit mit Pferden. [Combined equipment for horse skidding.] *Forstarchiv* 31 (11/12), 1960 (223-4). [G.] [Cf. *F.A.* 21 No. 3230.]

3177. KÖRTGE, W. Ein neues Rückegerät für Pferdezug. [A modern contrivance for horse skidding.] *Allg. Forstzeitschr.* 10 (6), 1961 (114-5). [G.]

Describes, with illustrations, the VSA skidding carriage [cf. *F.A.* 21 No. 3230].

3178. ARNKIL, J. E. Puutavaran hevoskuljetus Fössingen kumipyörärattailla lumettoman maan aikana. [Cordwood haulage with the Fössingen carriage during the snowless period.] *Metsät. Aikak.* 1960 (11), (385...396, 418). [Fie.]

The Swedish four-wheeled, rubber-tyred horse-drawn "Fössingen" carriage [illustrated] has been used experimentally by the Finnish Forest Service since 1957. In autumn 1959, it was tested during the hauling of 7700 cu. m. stacked measure, on medium terrain (typical of N. Finland), over distances of 0.15 to 0.4 km. Mean load was 2.0 cu. m. for green and 3.7 cu. m. for seasoned timber. The output/hour ranged, with site and conditions, from 4.0 to 6.9 cu. m., and that per 6.65-hour working day from 26.6 to 45.9 cu. m., figures considerably above the normal for winter haulage. The use of the carriage is possible only on firm ground, though short stretches of dry peat cause no difficulty. Uphill slopes caused less trouble than in winter haulage; no experience of long downward slopes is available, but the brakes worked well on short ones. The high output resulted mainly from the reduced times of loading and unloading compared with winter haulage. *From author's summary.*

3179. ALEKSEEV, S. A., and KUZ'MINOV, G. P. O dvigateľjah vozdušnogo ohlaždenija dlja lesnyh mašin. [Air-cooled engines for forest machines.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (60-7). [Russ.]

An account of the advantages (economy, reliability and efficiency) of air-cooled engines for tractors and lorries, particularly for winter work in the Soviet subarctic and arctic regions.

3180. PETRUŠA, G. N. Vybór parametrov trelevočnyh traktorov. [Choice of parameters for skidding tractors.] *Lesn. Prom.* 1960 (12), (4-6). [Russ.]

From theoretical considerations, proposes that three sizes of skidding tractor should be available for tree-length logs of (1) 0.1-0.3 cu. m., (2) 0.5-1 cu. m., and (3) >1 cu. m. The specifications for such tractors would be respectively: 25-30, 45-55 and 105-125 h.p.; load capacity 3-3.5, 6-7, and 16-19 cu. m.; own weight 3-3.5, 5-6 and 10-13 tons; speed with load 4.5-5.5, 3.5-4, and 3-3.5 km./hr.; calculated output per shift, assuming 80% of the time is utilized, 35-40, 80-85 and 160-170 cu. m. There are at present in the U.S.S.R. tractors that fulfil most of the requirements for (2) and (3), but as yet there is no specialized light, small, manoeuvrable tractor for skidding tree-length logs of size (1).

3181. SZEPESI, L. A traktor helye a faanyag-mozgatásban. [The place of the tractor in the movement of timber.] *Erdő* 9 (3), 1960 (89-96 + smries. in suppl.). [Hu.russ.g.]

A tractor of 45-55 h.p., 2500 kg. tractive force and 2-50 km./hr. speed range, with pneumatic tyres and 4-wheel drive is the best type to meet local conditions and the main tasks of skidding, primary extraction, transport, loading, and road maintenance.

3182. SÖDERLUND, J. A., and WICKSTRÖM, R. Hjultraktorn i transportarbete. Markgrepp och

slirning vid körning på snö- och isväg med och utan slirskydd. [Wheeled tractors in transport work. Ground adhesion and slip on snow or ice roads with or without anti-skid devices.] *Svenska SkogsvFören. Tidskr.* 58 (4), 1960 (281-98). [Sw.sw.e.e.]

Describes investigations complementary to those on bare ground [cf. F.A. 21 No. 3233] involving 300 tests under varying conditions on (a) ice, (b) soft snow, (c) compact snow, (d) gritted compact snow, (e) asphalt and (f) hard gravel. Best ground adhesion on winter roads was on (d) without chains. Chains were highly effective on (b) and (c), less so on (a) and in some cases detrimental on (d).

3183. PECHMANN, H. VON, and WUTZ, A. Leistungsuntersuchungen bei der Winterbringung von Holz mit Schleppern und Handziehschlitten. [Output investigations in skidding wood in winter with tractors and hand-pulled sledges.] *Forstwiss. Cbl.* 79 (11/12), 1960 (374-94). 8 refs. [G.g.]

An analysis of time studies at 7 different sites, using four types of tractor with sledges, and also hand-drawn sledges, in conifers and hardwoods. The use of tractors increased output per day and output per worker considerably.

3184. Distribution of tractor operating time. *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2017 (B-8-f), 1961. pp. 2.

An analysis of tractor operating time by three companies in 1957-60 indicated that only ca. 60% of available tractor time is used productively. Details of time utilization are tabulated.

3185. VASIL'EV, Z. B. K voprosu opredelenija srednego rasstojanija prjamoj vyvozki lesa traktorami S-80. [Determining the mean [economic] distance of direct extraction by S-80 tractors.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (85-93). [Russ. russ.]

A fuller version of work already noticed [see F.A. 20 No. 602].

3186. KOENIG-FACHSENFIELD, R. Einsatz von Einachsschleppern mit Triebachsanhängern zum Stammholzrücken. [Using two-wheeled tractors with trailers driven from the power take-off shaft, for skidding logs.] *Forst- u. Holzw.* 16 (2), 1961 (51-3). [G.g.]

Outlines the principles of skidding with a 2-wheeled tractor and 2-wheeled p.t.o.-driven trailer. Trials were made with 2-wheeled tractors (an Agria 7-h.p. and a Hansa-Schmiedag 10-h.p.) and power-driven 2-wheeled trailers or skidding arches which held one end of the log(s) clear of the ground. These tractors proved able to skid stems of ca. 1.5 and ca. 2.5 cu. m. respectively. The big drawback is the strain imposed on the driver by the direct handle-steering, and interest in the method has now waned.

3187. SHAW, R. G. The Roadless Land-Rover. *Report, Mechanical Development Committee, Forestry Commission, London* No. 89, [1960]. pp. [3].

A description of the trial vehicle (a fully modified Land-Rover, with 10 × 28 wheels and tyres, and gear ratios, brakes, etc. suitable for these large

wheels), with notes on performance. In cross-country work the machine is outstanding, and will be very useful where an ability to negotiate obstacles is important. Defects revealed in the trials do not appear difficult to solve in production models.

3188. **The Steyr-Puch "Hafinger" vehicle.** *FAO For. Equipm. Note No. E.23.60*, 1960. pp. 1.

The "Hafinger" Type 700 AP (Steyr-Daimler-Puch, Vienna) is a 4-wheel-drive, light cross-country vehicle for transport on curved, narrow mountain roads and over rough terrain.

3189. LEONOVICH, I. I. Učet dinamičeskogo vozdejstviya avtomobilej na ležnevoje pokrytie. [Calculating the dynamic action of [timber] lorries on roads made of round logs.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (81-91). [Russ.russ.]

Presents formulae for determining the coefficient of dynamic action in relation to load, speed of travel, and type of unevenness.

3190. LEONOVICH, I. I. Opredelenie dinamičeskogo vozdejstviya avtomobilja pri dvizenii ego po ležnevoj doroge. [Determining the dynamic effect of a lorry when moving on a road made of logs.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (81-7). 3 refs. [Russ.]

Presents the results of vibrograph investigations on the effect of loaded timber lorries travelling at various speeds on log-surfaced roads.

3191. MORCOM, R. R. Report on studies to determine the economics of carrying empty logging trailers on the logging truck. *Aust. Timb. J.* 26 (10), 1960 (60-2, 131).

It is concluded that the hinged-pole method of loading and unloading single-axle trailers for this "pick-a-back" transport is cheaper than hauling empty trailers for distances >9 miles. Less efficient is a crane-and-sloping-runway method which requires haulage distances of >46 miles to show savings.

3192. HARKNESS, W. D. Hiabob attachment for Slashmobiles. *Woodl. Sect. Index Canad. Pulp Pap. Ass. No. 2013 (B-10)*, 1960. pp. 2.

Describes the design and operation of a knuckle-boom log-loader on mobile slashing [slash cross-cutting] equipment.

3193. PUOSKARI, O. Maatilan tukkiuormaa. [A farm log-loader.] *Teho, Helsinki* 1960 (9), (443-6). [Finsw.e.]

Comprises a light winch mounted on a tractor, with either a single curved upright support or an arch mounted on a sledge. Logs can be skidded to the sledge from distances of 40-50 m. *From author's summary.*

3194. **Mono-Rail transporter.** *FAO For. Equipm. Note No. C.33.60*, 1960. pp. 1.

The Mono-Rail Transporter (Road Machines (Sales) Ltd., West Drayton, Middlesex, England) consists of a power-wagon and trailer that travel unattended along a single line of rail. They are fitted with special bolsters to transport lengths of timber making up a load of 1-1.5 tons. Rail sections, 12 ft. long, are supported on low stands so as to

clear marshy ground. The rail can be laid easily by two men and is particularly suitable for use in narrow rides.

3195. ŠELKUNOV, V. V. O vybore rukovodjaščego pod'ema lesovoznykh železnych dorog kolej 750 mm. [Choice of the guiding gradient for forest railways of 750 mm. gauge.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (69-76). 2 refs. [Russ.]

Presents a method of determining optimum gradient, in relation to terrain, type of locomotives, exploitable volume, etc.

3196. BARTLEY, H. N. Material handling economics of unloading pulpwood from rail cars. *Paper Tr. J.* 144 (33), 1960 (36-7). P.O.

Examines the pros and cons of using different types of railway wagons in the U.S.A., and presents data on the costs of mechanical vs. hand unloading.

3197. HUGGARD, E. R. Ground-effect [air-cushion] machines for forestry? *Emp. For. Rev.* 39 (4), 1960 (463-6).

Outlines the principles according to which these machines function, and discusses their possible use in forestry. The cost/ton of using a ground-effect machine over a 10-mile haul is compared with that of a 10-ton lorry.

378. Water Transport

3198. ROSENGREN, S. Isens bärförmåga—praktiska överslagsberäkningar. [The bearing capacity of ice—practical estimates.] *Skogen* 48 (4), 1961 (69-70). 4 refs. [Sw.]

Discusses various factors affecting bearing capacity, and presents an equation for calculating maximum permissible load for loads of different area, based on load radius and ice thickness.

3199. KUZNECOV, D. V. Novoe v mehanizacii skatki lesa. [New ways of mechanized launching of timber.] *Lesn. Prom.* 1961 (3), (11-3). [Russ.]

Describes two methods, both essentially the same as a method already described [cf. *F.A.* 19 No. 4298]. In one of the methods there is the possibility of having launching by bulldozers going on simultaneously at the same site; in the other, the stacked logs or bundles are winched into the water on sledge-like log grabs.

3200. LOBANOV, JU. V. Vybora rasčetnogo stvora dlja opredelenija splavospobnosti lesopropusknykh ustrojstv gidrouzlov (pri molevom splave). [Selection of a basis for calculation in determining the capacity of chutes for moving timber through hydro-electric dams (with loose floating).] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (70-4). [Russ.]

Presents the results of theoretical and experimental investigations on the performance of log chutes without forced feeding of logs.

3201. MOSEVIČ, P. I., and SINGALEVIČ, M. S. Stanok dlja razmolevki lesa. [A [floating] installation for untying bundles [and unloading] timber.] *Lesn. Prom.* 1961 (3), (7-9). [Russ.]

Description and brief specifications of the installation, the VKF RSS-1, an improved and simpler

version of an installation already described [see F.A. 19 No. 4309], which will be serially manufactured.

38. Forest Engineering

383. Roads and Bridges

See also Nos. 3174, 3189-90, 3198.

3202. BYRNE, J. J., NELSON, R. J., and GOOGINS, P. H. **Logging road handbook: the effect of road design on hauling costs.** *Agric. Handb. U.S. Dep. Agric.* No. 183, 1960. pp. 65.

Analyses haulage costs, taking into account the use of diesel vs. petrol-driven lorries, size of hauling unit, advantages of paving or binding and smoothing the road surface, gradient, undulating gradients, alignment and width of road.

3203. TOIVONEN, T. **Metsähallituksen uudet metsäautotienormit.** [The new norms of the Finnish Forest Service for forest motor roads.] *Metsät. Aikak.* 1960 (10), (343-4, 368). [Fi.]

Forest roads have been divided into trunk roads (public highways or local roads), ordinary forest motor roads, and access roads, and these types are again subdivided by number of lanes, and purpose. Designs are available from the Forest Service.

3204. SKRIPOV, N. I., and SAVIN, L. E. **Sbornoe kolejnoe pokrytie iz rešetchatyh železobetonnyh plit na usah avtomobil'nyh lesovoznyh dorog.** [Prefabricated tracks of perforated, reinforced concrete slabs on the spurs of lorry extraction roads.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (70-80). [Russ.]

[Cf. F.A. 21 No. 4501.] Examination of spur roads of this type has shown that the minimum preparations for laying the slabs are the removal of stumps, roots, and vegetation, and rough levelling by bulldozer. A foundation of brushwood may also be necessary in places. The slabs should not be laid across peat bogs.

3205. SKRIPOV, N. I., and SAVIN, L. E. **Ustojčivost' železobetonnyh plit na usah lesovoznyh avtomobil'nyh dorog.** [The strength of reinforced concrete slabs on spur roads for extraction by lorry.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (63-9). 2 refs. [Russ.]

Reports on the behaviour of the slabs [cf. F.A. 21 No. 4501] in use on spur roads, where they are laid after only a rough levelling of the track. In particular, measurements were made of the sink and lift (rocking) of the slabs as loaded lorries and trailers pass over them. This rocking causes many defects and breakages in the slabs. It is concluded that extra expenditure on more careful preparation of the track would increase slab service life and prove economically sound. Improved joints between slabs are also advocated.

3206. STOUT, A. W. **Dust control on dirt roads.** *Res. Note West. Pine Ass.* No. 6. 611, 1955 (rev. 1960). pp. 2.

Discusses and estimates costs of treatments for dust control on unsurfaced roads. These include: wetting agents added to sprinkled water (ca. \$15/

mile plus cost of water); CaCl_2 spread dry or in solution (at \$80/ton); asphalt and heavy fuel-oil (giving a near-macadam surface for \$2000/mile when applied at 2-2½ gal./sq. yd.); and concentrated waste liquor from sulphite paper mills, alone or in combination with oil or asphalt.

3207. SPRINGENSCHMID, R. **Betondecken und Bodenverfestigung mit Zement auf Forststrassen.** [Concrete surfaces and soil stabilization with cement on forest roads.] *Allg. Forstztg.* 72 (1/2), 1960 (12-4). 12 refs. [G.]

A brief description of the method and its uses, chiefly for stabilization of roadbeds under thin surface layers of concrete or compacted soil, with notes on mixing ratios, thicknesses for various soil conditions, equipment, etc.

3208. MADAS, L. **A visegrádi földútstabilizáció alkalmával szerzett néhány tapasztalatról.** [Experience in stabilizing an earth road in Visegrad.] *Erdő* 8 (2), 1959 (61-7 + smries. in suppl.). [Hu.russ.g.]

A mixture of cement and bitumen was used with a 10-ton, pneumatic-tyred street roller, to stabilize 500 m. of road and a parking place of 250 sq. m. A careful mechanical analysis of the soil should be made before work begins.

3209. ANDOR, J., BOSZE, A., and DEMETER, S. **Stabilizált gyűjtőutak építése a Délzalai Állami Erdőgazdaságban.** [Construction of stabilized earth roads in the Délzala state forest.] *Erdő* 9 (7), 1960 (258-64 + smries. in suppl.). [Hu.russ.g.]

This forest of 2300 ha., containing 502,100 cu. m. of largely overmature timber was rendered accessible by an 11.8-km. earth road, stabilized partly with cement, partly with bituminized gravel. Its construction and cost are explained in detail. The work is amortized in 13-8 years.

385. Drainage, Irrigation, Sedimentation

See also No. 3097.

3210. Grøftefres. [Rotary ditcher.] *Norsk Skogbr.* 6 (22), 1960 (780-1). [Nor.]

The ditcher (illustrated), which has 3 blades, is mounted on and powered from a tractor. In fairly wet soil with small roots, it can dig 1800 m. of ditch, 45 cm. deep, per hour, but it is less suitable for ground with large roots and hard fragments of wood. The cost per m. of ditching in suitable soil is very low and the ditcher distributes widely the material from the ditch, which has a good fertilizing effect.

3211. SALAS, H. S. **Resultados con una pequeña máquina zanjadora, y su posible utilización para plantaciones forestales en las islas del Delta del Paraná.** [Results obtained with a small mechanical ditcher, and its possible use for forest plantations in the islands of the Paraná Delta.] *Rev. for. argent.* 4 (4), 1960 (129-32). [Span.]

Describes the Ritscher Ditch Cleaner, York, manufactured by Karl Ritscher G.m.b.H., Hamburg, a machine that the author considers particularly suitable for drainage work on the islands of the Paraná Delta, where the use of the dragline type of equipment is often precluded because of its weight.

To give a ditch 1.8 m. wide the ditcher moves at a rate of 26 m./hr., leaving a trapezoidal ditch ca. 0.75-0.8 m. in depth. The cost of such a ditch at present rates is estimated at ca. \$4-1/m.

3212. THURMANN-MOE, P. Grøftingens rasjonalisering på gjødselt. [Rationalization of drainage on sites where fertilizers are applied.] *Norsk Skogbr.* 7 (1), 1961 (5-8). [Nor.]

Two forms of drainage discussed as perhaps more advantageous than the normal deep drainage system (90-100 cm. deep, with a recommended spacing of 25-30 m. in Eastern and Southern Norway) are a

more widely spaced deep drainage system with (a) closely spaced surface channels, 2 m. apart and 20-30 cm. deep or (b) less closely spaced ditches, 5-8 m. apart and 50-60 cm. deep. An example where (a) has been used, with the deep drains 40 m. apart and the channels 20 cm. deep, has given good results. Costs for (a) are calculated at Kr. 46.60 and for (b) at Kr. 41.50 (8-m. spacing) and Kr. 57.50 (5-m. spacing) per dekar. Method (a) is considered likely to be more generally satisfactory than (b). Types of equipment for making the drainage channels are briefly discussed.

4. FOREST INJURIES AND PROTECTION

See also No. 2941.

3213. BYKOVA, E. B. [Compiler]. Spisok pečatnyh rabot, vypolnennyh v laboratorii po vrediteljam i boleznyam lesnyh i polezaščitnyh nasaždenij za period s 1930 do 1958. [List of published works by the Laboratory for pests and diseases of forest stands and shelterbelts, 1930-58.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (331-40). 205 refs. [Russ.] B.A.P.

205 references, arranged chronologically.

3214. SĂVULESCU, A., HULEA, A., and BUCUR, E. [Editors]. Protecția plantelor în sprijinul zonării producției agricole în R.P.R. [Plant protection as an aid to regional zoning of agricultural crops in Rumania.] Editura Academiei Republicii Romine, Bucarest. 1960. pp. 416. 121 refs. [Rum.russ.f.] Includes a chapter on diseases and insect pests of trees (a) in forests, (b) in shelterbelts. There is a 16-page French summary.

41. General Technique of Forest Protection. Types of Injury

3215. SORAUER, P. Handbuch der Pflanzenkrankheiten. Band VI. Pflanzenschutz. 3. Lieferung: Biologische Schädlingsbekämpfung. Die technischen Mittel des Pflanzenschutzes. [Manual of plant pathology. Vol. VI. Plant protection. No. 3. Biological control. Technical equipment for plant protection.] Paul Parey, Berlin. 2nd ed., 1961. pp. 16 + 627. Many refs. [G.] Price DM. 190 [£16. 6s.]

[Cf. F.A. 13 No. 3937; 19 No. 1981.] The section on biological control, including the use of micro-organisms, arthropods, invertebrate and vertebrate animals, fungi and other plants against noxious arthropods, vertebrates, nematodes, weeds, etc., is by J. M. Franz; that on equipment, by H. Koch and H. Goossen, includes soil sterilizing, seed treatment, spraying and dusting, gassing and injecting, trapping and repelling, and thermal, acoustic (including ultrasonic) and electrical apparatus. Electrical methods include live wires for trapping insects, H.F. current, infra-red and ultra-violet radiation, and radio-active isotopes.

3216. DURASOVÁ, M. Vliv chemických přípravků na zvěř a ostatní živočichy. [Effect of

chemical [plant protection] preparations on game and other animals.] *Práce Výzkum. Úst. Lesn. ČSR* No. 20, 1960 (227-63). 211 refs. [Cz.russ.g.]

An account of Czechoslovakian work (supplemented by references to world literature) on the effect of insecticides, fungicides, herbicides, rodenticides and artificial fertilizers on game and other animals and birds.

3217. Plant Quarantine Announcements: Greece. *FAO Plant Prot. Bull.* 8 (11), 1960 (137-40).

Particulars (including regulations on forest tree seed, planting stock, and timber) of a royal decree of Feb. 1959, which revokes that of Dec. 1954 governing the importation of plants and plant products.

42. Injuries from Inorganic Agencies other than Fire

See also No. 3427.

421. Air Currents

See also No. 3419.

3218. BROUARD, N. R. A brief account of the 1960 cyclones and their effects upon exotic plantations in Mauritius. *Emp. For. Rev.* 39 (4), 1960 (411-6).

Outlines the history of forestry and the introduction of exotics in Mauritius, and describes damage done by two severe cyclones in 1960. In consideration of the recurrent nature of such cyclones, Pines and *Cryptomeria japonica* are regarded as the most useful species for the uplands, and *Tabebuia pallida*, *Swietenia mahagoni*, *Araucaria cunninghamii*, and *Casuarina equisetifolia* for the lowlands.

3219. BATZER, H. O. Two cases of wind damage to Balsam Fir after cutting. *Tech. Note Lake St. For. Exp. Sta. No. 590*, 1960. pp. 2.

Data on wind damage on 2 replications of 3 blocks of 20-25 acres in N. Minnesota Spruce/Fir stands are tabulated and related to wind velocity. The following treatments, to test felling as a means of controlling Spruce-budworm damage, had been applied in each replication: commercial clear felling; partial felling (removing 19 and 27% b.a.); no felling. Though partial felling was found to increase

wind damage compared with controls, it may be justified if Spruce-budworm damage is sufficiently reduced thereby.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 2847, 2850-1, 3108, 3120, 3480.

3220. BAYLIS, G. T. S. An example of winter injury to Silver Beech at moderate altitude. *Proc. N.Z. Ecol. Soc.* No. 6, 1958 (21-2). 9 refs.

Nothofagus menziesii, a timberline species in New Zealand, is not found above 2400 ft. on Maungatua Range near Dunedin. An example of apparent frost damage to an isolated clump of trees at 2400 ft. is described, which suggests that mutual shelter may be an important factor in enabling Beech forests to grow at these altitudes.

3221. POURTET, J. À propos du dépérissement "climatique" des peupliers. [The "climatic" dieback of Poplars.] *Rev. for. franç.* 13 (1), 1961 (31-4). [F.]

Further examination of *Populus × robusta* plantations affected by the severe frosts of 1956 followed by mild winters and late frosts in 1957 and 1958 [cf. *F.A.* 20 No. 1919] showed three types of reaction: (1) irreversible dieback in old or sickly trees; (2) a sharp reduction in increment and striking, but reparable, dieback in young (15-20 years) trees on good sites; (3) reduction in increment with no visible signs of ill health in quite young (10 years) and vigorous trees.

3222. [Damage to conifers by drought.] *Korte Meded. Bosbouwproefsta., Wageningen* No. 43, 1960 (8-9). [Du.]

Damage to young Douglas Fir in the 1959 drought occurred mainly where the site was overgrown with weeds, and that to Larch where trees had been planted on soils that were too dry. Douglas in mixture with hardwoods also suffered from drought. On one of the sample plots, damage caused by Alder was greater than that by Birch, although in normal years Birch has an unfavourable and Alder a favourable effect on growth. On another plot, Douglas in mixture with *Prunus serotina* was more damaged than that mixed with Alder; here, however, the ground vegetation—heath and grass respectively—was probably important. In older plantations, the greatest drying occurred at ages of ca. 10-25 years, especially in Larch, water consumption of a stand being highest at this period, and then decreasing. Measurements of moisture tension in a stand of Douglas >40 years old showed values well below wilting point, whereas in younger stands such values had already been reached, or nearly so. It was also found that under very recently thinned stands there was a fair reserve of available water.

3223. SETH, S. K., KHAN, M. A. W., and YADAV, J. S. P. Sal mortality in Bihar. *Indian For.* 86 (11), 1960 (645-79). 33 refs.

Wide-spread Sal (*Shorea robusta*) mortality occurred in the Forest Divisions of Daltongunj, Latehar and Kolhan in Bihar from 1951 onwards. Drought was suspected to be the main cause, and

accordingly a study of climate was undertaken and monthly fluctuations of soil moisture in 6 ft. of profile were computed at three locations for 1941 to 1955. These values of soil moisture were grouped into five categories and, taking into consideration the periods during which each of these moisture conditions prevailed in the root zones, 'drought values' and 'drought severity values' were determined as % departures from the normal conditions of duration and moisture status. These values were integrated to arrive at 'drought mortality values', and the effect of successive drought years was assessed as 'cumulative drought mortality values' (C.D.M.V.). The observed pattern of mortality was correlated with these values. The close correlation between the cumulative drought mortality values and the actual pattern of mortality at Daltongunj proves that drought is the main cause of mortality. Management of such drought-affected Sal forests is also suggested. *From authors' summary.*

423. Precipitations

3224. BRENDER, E. V., and ROMANCIER, R. M. Glaze damage in Loblolly Pine plantations. *Sth. Lumberm.* 201 (2513), 1960 (168).

When a severe ice storm hit a thinning study area in Georgia, no trees were completely destroyed in unthinned stands (b.a. ca. 150 sq. ft./acre). Stands thinned to $\frac{1}{2}$ the original b.a., however, suffered 3 times as many total losses as stands thinned to $\frac{3}{4}$. Tree loss was most severe in row-thinned stands or stands thinned from above. Stands thinned from below or selectively suffered less.

424. Soil Conditions; Erosion Effects

See also Nos. 2860, 2882, 3280.

3225. BASEDEN, S. C. Notes on deficiency symptoms in forest nurseries. *Papua N. Guinea agric. J.* 13 (2), 1960 (76-7).

Extensive chlorosis followed by bud rot in *Araucaria klinkii* and *A. cunninghamii* was found to be due to Fe deficiency induced by high soil pH. Spraying with 1% Fe citrate with a wetting agent gave a marked response, but lowering the soil pH by applying S at 1.6 tons/acre, was more effective. Chlorotic symptoms in Teak on pumice silt ash alluvium were shown to be due to lack of N (organic matter in soil <0.2%). Soil treatment was again more effective than spraying (with 1% urea).

425. Chemical Influences (Atmospheric)

3226. GORHAM, E., and GORDON, A. G. The influence of smelter fumes upon the chemical composition of lake waters near Sudbury, Ontario, and upon the surrounding vegetation. *Canad. J. Bot.* 38 (4), 1960 (477-87). 11 refs. O.R.S.

Pollution of surface waters by S is frequently high within 5 miles of the smelters, but beyond 15 miles is negligible. Some of the polluted waters are strongly acid, with pH values as low as 3.3. Weathering of Ca from soils and rocks has been increased by Na_2SO_4 in polluted air. Damage to terrestrial vegetation (as estimated by helicopter from tree cover) is frequently marked within ca. 5 miles of the

smelters, but is not obvious beyond this distance, except in the absence of sensitive species such as White Pine [cf. F.A. 20 No. 3292]. Severe damage occurs chiefly within some 2 miles of the smelters. [Cf. F.A. 22 No. 662.]

3227. ZINKERNAGEL, H. Über den Wert der chemischen Bestimmung des Schwefelgehaltes in Blättern bei Rauchschadensdiagnosen. [The S content of leaves and its value as a criterion of smoke damage.] *Schriftenreihe des Vereins für Wasser-, Boden- und Lufthygiene, Berlin-Dahlem, Stuttgart* No. 13, 1958 (21-8). 12 refs. [G.g.] L.S.

In a non-industrial suburb of Berlin, S contents per 100 sq. cm. foliage of an Apple tree fluctuated from 1.5 mg. to 3 mg. in two growing seasons, with maxima and minima occurring at different months in each. S content per g. of dry matter, and the dry-matter weight of 100 sq. cm. foliage also fluctuated widely. The S fluctuations in a Chestnut tree (observed for one year only) were only slightly less. Careful parallel investigations of healthy and suspected trees are recommended in smoke damage diagnosis.

3228. BETHGE, H. Spektralphotometrische Untersuchungen rauchgeschädigter Pflanzen. Spektralphotometrie und Rauchschadendiagnostik. [Spectrophotometry and the diagnosis of smoke damage in plants.] *Schriftenreihe des Vereins für Wasser-, Boden- und Lufthygiene, Berlin-Dahlem, Stuttgart* Nos. 12, 1957 (3-22); 13, 1958 (3-10). 48 refs. [G.g.] L.S.

Part I describes the apparatus and techniques used in these tests to discover phaeophytin in chlorophyll extracts as an indicator of injury by acids. Concentrations of 0.001% HCl (corresponding to 10 mg./cu. m. air) and roughly 0.01% SO₂ could be detected, if added to an extract from healthy Apple leaves, by changes in the difference $\Delta = \log E_{590 \mu\mu} - \log E_{535 \mu\mu}$, where E is the extinction value of the wavelengths concerned. Part II presents Δ values for 63 species, including many forest trees and weeds. These ranged from 0.211 to 0.342, and varied considerably between seasons, individuals, and parts of individuals, but it is concluded that a difference in Δ value of ≤ 0.05 between a healthy plant and one suspected of smoke injury, growing under comparable conditions, would confirm the existence of such injury.

3229. BÜSSCHER, M. Spektralphotometrischer Nachweis von Säureschäden an Pflanzen. [Spectrophotometric diagnosis of acid injuries to plants.] *Schriftenreihe des Vereins für Wasser-, Boden- und Lufthygiene, Berlin-Dahlem, Stuttgart* No. 13, 1958 (11-20). 22 refs. [G.g.] L.S.

Describes analyses of chlorophyll extracts to which HCl was added. The decrease in Δ values with rising concentrations [cf. preceding abstr.] was used for resistance rating. Most of the forest trees tested, including Silver Fir, Norway Spruce and *Pinus strobus*, were classed as normal. Among the more resistant plants were *Taxus baccata* and *Sambucus nigra*; among the highly sensitive ones, rather surprisingly, were many species often found

in towns, including *Ulmus carpinifolia*, *Robinia pseudoacacia*, and *Crataegus monogyna*.

426. Electrical and Cosmic Influences

See Nos. 3234, 3482.

429. Injuries from Inorganic Agencies (Miscellaneous)

3230. PLATT, R. B. Mixed gamma-neutron radiation effects on flood-plain and Oak/Hickory/Pine forests. *Abstr. in Bull. Ecol. Soc. Amer.* 41 (3), 1960 (93-4). A.P.B.

Irradiation was at distances of 500-2000 ft. with mixed γ /neutron radiation from an air-shielded reactor in the centre of a 10,000-acre forest on the N. Georgia Piedmont plateau. Doses ranged from 16,000 gamma r units plus 1600 neutron r.e.p. at 500 ft. to ca. $\frac{1}{20}$ this dose at 2000 ft. The effects on 25 woody species are described. There are wide variations between species. The most noticeable general effect other than morphological aberrations and death was a shortening of the growing season by prolonging winter dormancy and speeding up summer and autumn growth processes.

3231. PEDIGO, R. A. The effects of ionizing radiation on the ecology of *Pinus taeda*. *Abstr. in Bull. Ecol. Soc. Amer.* 41 (3), 1960 (94-5). A.P.B.

Striking morphological effects occur in *P. taeda* after exposure to ca. 10,000 rem, while doses of ca. 25,000 rem seem to kill mature trees. Seedlings show a marked physiological response after exposure to 1000 rem with an l.d. 50 of ca. 5000 rem. These responses and the differential effects of long-term radiation on *P. taeda* and its usual associates suggest that under the effects of such radiation the rôle of Pine in secondary succession may be greatly reduced, if not eliminated.

43. Forest Fires

See also Nos. 2896-7, 3311.

3232. CROSBY, J. S. Forest and range fire problems of the Missouri Ozarks. *Misc. Release Cent. St. For. Exp. Sta. No. 32, 1960*. pp. 53. 4 refs.

Examines the region, cover type, climate, local attitudes to fire, and other problems, in the light of current research. Almost all fires in Missouri are caused by man, ostensibly to increase forage production. Frequent burning, often on a 3- to 5-year cycle, is the chief reason why the 12.2 million acres of forest land in the Missouri Ozarks are producing only $\frac{1}{3}$ - $\frac{1}{2}$ of their potential.

431. Predisposing Factors and Causes.

Fire Danger. Fire Behaviour

3233. PIRSKO, A. R. 1960 fire weather severity in California. *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta. No. 54, 1960*. pp. 14.

Abnormal dryness and temperatures made 1960 the most severe fire season in California in recent times. Three basic indexes of fire-danger rating (the high ignition, burning, and fire-load indexes), applied to 6 sample areas, appeared to measure

accurately the influence of hot dry weather on forest fuels, and to show great promise in fire-control planning.

3234. BENNETT, W. D. Survey of lightning fire occurrences in Canada's forests—1950 to 1959. *Woodl. Res. Index Pulp Pap. Res. Inst. Can. No. 120*, 1960. pp. 9 + 4 maps. 1 ref.

In accordance with previous recommendations [see *F.A.* 20 No. 657], the survey was made primarily as a basis for the selection of logical areas for research on lightning and lightning fires. Four areas are identified as having the highest lightning-fire incidence. Research should be started in one or more of these areas as soon as possible.

3235. DEICHMANN, V. VON. Über die Zünd- und Brenneigenschaften von Waldbodenbelägen. [The ignition and combustion properties of forest-floor material.] *Forstwiss. Cbl.* 79 (11/12), 1960 (352–61). 11 refs. [G.G.]

Laboratory tests were made with the Jentzsch apparatus [cf. *F.A.* 15 No. 4034] on (1) *Aira flexuosa*, *Festuca ovina*, *Poa nemoralis* and *Luzula pilosa*, (2) needles fallen from *Pinus sylvestris*, (3) needles fallen from *Picea abies*, and (4) the upper, not yet lignified, shoots of *Calluna vulgaris*, all collected in the spring before the start of the growing season. Results, graphed, show that (1) is the most dangerous forest-floor cover, and that (2) and (3), especially as a dry raw-humus layer in comminuted form, can be dangerous as initial ignition materials.

3236. ŽDANKO, V. A. Osnovy opredeleniya požarnoj opasnosti v lesu v zavisimosti ot pogody. [Basis for determining forest fire danger in relation to weather.] *Lesn. Hoz.* 12 (6), 1960 (39–44). 1 ref. [Russ.]

Develops a formula for determining the m.c. of forest fuels. Tests in various Pine forest types showed it to be more accurate than some of the formulae and graphical methods previously used in the U.S.S.R.

3237. FAHNESTOCK, G. R. Logging slash flammability. *Res. Pap. Intermt. For. Range Exp. Sta.* No. 58, 1960. pp. 67. 45 refs.

Preliminary results of this investigation have already been published [see *F.A.* 15 Nos. 1405, 1467–8]. The present publication reports more technically and in greater detail the results of the first 5 years of research on slash flammability. It shows how various factors (e.g. loss of needles, drying rate, quantity, species, rate of decomposition) affect flammability, and describes new methods for more accurate evaluation of the hazard of varied slash conditions than has been possible hitherto.

432. Prevention and Control

See also No. 2947.

3238. REINECKER, H. P., and PHILLIPS, C. B. Fighting forest fires with air tankers 1958–1959. Division of Forestry, California. [1960.] pp. 53. 31 refs.

Results obtained in the two seasons in California are described separately. On the basis of the

experience gained, recommendations are made on e.g. equipment, pilot proficiency, training, planning, drop techniques, safety and choice of retardant.

435. Benefits of Fire Control. Injurious Effects of Fire

See also No. 3377.

3239. AHLGREN, I. F., and AHLGREN, C. E. Ecological effects of forest fires. *Bot. Rev.* 26 (4), 1960 (483–535). 358 refs.

A review of literature, with chief reference to N. America, but including also much literature from other parts of the world, under the main heads: effects of fire on soil (moisture relations, texture, temperature during and after burning, fertility, and chemical composition); and effects of fire on living organisms (lower plants, plant diseases and pests, bacteria, invertebrates, vertebrates, and plant succession).

3240. VUKIČEVIĆ, E., and MILOŠEVIĆ, R. Dinamika vegetacije i mikrobna populacija nekih šumskih požarišta. [Dynamics of the vegetation and microbe population of some forest fire areas.] *Šumarstvo* 13 (5/6), 1960 (295–306). 12 refs. [Serb.f.]

The sites of fires occurring (a) 2 days, and (b) one year, (c) 2, (d) 5, and (e) 10 years previously in *Fagetum montanum* forest at the Majdanpek Estate were investigated. Plant species were divided into those found (1) in the previous plant association, (2) in the previous association and on sites of fires, (3) only on the sites of fires, and (4) other species; species in (3) reached their optimum development on (d) sites. Soil samples taken at various depths showed that, after fires, soil acidity and humus content decreased, but increased again on (e) sites, as did the C/N ratio and K and H_3PO_4 content. The influence of fire on microbe populations was most marked on (a) and then on (b) sites. Numbers of heterotrophic bacteria, fungi and actinomycetes increased, but those of aerobic ammonifying bacteria decreased. An increase in the latter and a decrease in other micro-organisms on (e) suggested a return to the conditions found in forest untouched by fire. [Cf. *F.A.* 17 No. 2600.]

3241. CHARTER, J. R., and KEAY, R. W. J. Assessment of the Olokemeji fire-control experiment (investigation 254) 28 years after institution. *Inform. Bull. Dep. For. Res. Nigeria* No. 3, 1960. pp. 32. 23 refs.

Compares in detail, with profile diagrams, photographs and species-frequency tables (1929–30, 1935, 1957), the effect of (a) late, (b) early and (c) no burning in an area near the derived savanna within the lowland rain-forest zone, with an annual rainfall of 48 in. (4 months with 2 in.). In 1929–30 (a), (b), and (c) plots, each 0.43 acre, had respectively trees and shrubs of 25, 30, and 30 fire-tolerant species. In 1957 the number of fire-tolerant, fire-tender and exotic species invasive from plantations, were for (a) (a devastated savanna) 14, 0, 2; (b) (a patchwork of gradually expanding unburned tree clumps in tall grass savanna woodland) 21, 8, 4; (c) (dense young forest) 17, 20, 26 respectively.

3242. FENTON, R. H. Seven years later: effects of wildfire in a young stand of Virginia Pine and hardwoods. *For. Res. Note Ntheast. For. Exp. Sta.* No. 100, 1960. pp. 4. 1 ref.

[Cf. F.A. 18 No. 302.] Superficially there are no longer any signs of the fire, but measurement revealed a net b.a. loss of 20.4 sq. ft./acre on burned plots during the 7 years vs. a net gain of 43.1 sq. ft./acre on the unburned plot. Most of the seedlings on the burn show the ill effects of hardwood competition in sparse foliage and poor height growth.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See Nos. 3239-41.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 3074, 3085, 3092, 3109, 3215-6.

3243. STAL'SKAJA, P. V. Izmenenie nekotorykh biologičeskikh osobennostej *Deschampsia flexuosa* Trin. na lugovikovykh vyrubkah. [The change of certain biological features of *D. flexuosa* on clear fellings it has invaded.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (13-8). 7 refs. [Russ.]

Studies the seeding and root development of *D. flexuosa* on fellings 2, 4, 8, 9, 10, 12 and 14 years old in the *Pinetum myrtillosum*, Archangel region. Control (mechanical or chemical) should start from the second half of July, and on fellings two years old (i.e. before the grass covers >15% of the area).

3244. MASSEY, C. L., and PIERCE, D. A. *Trirhabda nitidicollis*, a pest of Rabbitbrush in New Mexico. *Repr. from Journal of Range Management*, Portland 13 (4), 1960 (216-7).

Larvae of this chrysomelid were found defoliating Rabbitbrush (*Chrysothamnus nauseosus*) over a wide area in New Mexico in 1957. Stages in its life history are described and illustrated, with notes on habits. It is possible that *T. nitidicollis* could be used to control Rabbitbrush where the plant is considered a noxious weed.

3245. HORTON, J. S. Use of a root plow in clearing Tamarisk stands. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 50, 1960. pp. 6. 4 refs.

Tamarix pentandra, which has invaded many thousands of acres of flood-plains and delta deposits in the S.W. United States, can be controlled by the use of heavy mechanical equipment (experiments have been made with a Fleco root-plough assembled on a D-7 Caterpillar). Methods of operation are recommended.

3246. GARY, H. L. Utilization of Five-Stamen Tamarisk [*Tamarix pentandra*] by cattle. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 51, 1960. pp. 4.

Experiments on grazed and ungrazed plots indicated that cattle grazed significant amounts of Tamarisk coppice shoots, and further information should be obtained to determine the possibility of controlling coppice regrowth and invasion of Tamarisk by grazing.

3247. WOODFORD, E. K., and SAGAR, G. R. [Editors]. *Herbicides and the soil*. Blackwell Scientific Publications, Oxford, 1960. pp. [ii] + 88. Many refs. Price 17s. 6d.

Contains the following papers (with discussion) read at a symposium in Oxford of the British Weed Control Council; Microbiological breakdown of herbicides in soils (*L. J. Audus*); The effect of herbicides on micro-organisms (*W. W. Fletcher*); Physico-chemical aspects of the availability of herbicides in soils (*G. S. Hartley*); and The persistence of some important herbicides in the soil (*W. van der Zweep*).

3248. VLASZATY, Ö. Vegyszerek alkalmazása az erdőművelésben. [The use of chemicals in forestry.] *Erdő* 9 (7), 1960 (269-72 + smries. in suppl.). [Hu.russ.g.]

Recommends NaClO₃ for the complete eradication of *Agropyron repens* and *Calamagrostis epigeios*; simazin for controlling weeds between the rows of one-year Oak or *Prunus avium*, 2-year Scots or Black Pine, and for Robinia and Poplar saplings; and for preventing coppicing, Tormona-100, which is also useful for suppressing undesirable shrubs.

3249. BØRRESEN, E. Simazin i skogplanteskoler og i plantefelt. [Simazin in forest nurseries and planting areas.] *Norsk Skogbr.* 6 (23/24), 1960 (809-10). [Nor.]

Gives some details of Scandinavian experience and makes recommendations on rates and times of application and concentration, with information on costs. [Cf. F.A. 21 No. 1714.]

3250. DAY, M. W. Control of Red Maple stump sprouts. *Quart. Bull. Mich. Agric. Exp. Sta.* 43 (2), 1960 (287-91).

Several herbicides were tested as sprays for preventing sprouting from (a) recently cut *Acer rubrum* stumps, and for killing (b) established shoots on older stumps. In oil solution, the propylene glycol butyl ether and butoxy ethanol esters of 2,4,5-T were completely effective at concentrations of 12 lb. acid/100 gal. solution (a.h.g.) for (a) and 16 lb. a.h.g. for (b). Water solutions were not as effective as oil solutions, but on (a), products containing polychlorinated benzoic acid, propylene glycol butyl ether ester of 2,4,5-T, and triethylamine salt of 2,4,5-T showed considerable promise, the last giving the best results. Treatment of (b) showed similar results, shoots of <1 in. diam. usually being killed. [Cf. F.A. 22 No. 688.] *From author's summary.*

3251. COX, P., and RITCHIE, R. Chemical brush control on Latour State Forest. *St. For. Note Calif. Div. For.* No. 3, 1960. pp. 8. 10 refs.

Successful control of Chinkapin (*Castanopsis sempervirens*) and other less persistent species was obtained by spraying conifer plantations with a mixture of 2,4,5-T and 2,4,5-TP in Aug. and Oct. Two applications, 1-3 years apart, may be required to release planted trees from competition. The conifers were undamaged when normal care was taken to spray on the ground.

3252. BRUN, W. A., CRUZADO, H. J., and MUZIK, T. J. The chemical defoliation and desiccation of tropical woody plants. *Trop. Agriculture, Trin.* 38 (1), 1961 (69-81). 3 refs.

Tests carried out on 16 mesophytic (80 in. rainfall) and 9 xerophytic genera (20 in.) with 51 formulations, show the most effective defoliants to be mixtures of butine 1,4-diol and tributyl phosphorothioite, neither being so effective alone. One mixture caused a mean defoliation of 82% in one week in the mesophytic species (innately or environmentally more resistant). Of these, 14 showed 100% desiccation (discoloration and blotching) in one week with tributyl phosphate, the most effective desiccator. Rain falling within 5 minutes did not affect this result, though rain interfered with some defoliants on some species. Spraying the undersurface of leaves was generally the more—sometimes the only—effective method, because these chemicals operate through the stomata.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

3253. HAWKSWORTH, F. G. Distribution of *Ponderosa* Pine dwarf mistletoe in the vicinity of an Arizona volcano. *Ecology* 41 (4), 1960 (799-800). 6 refs.

The *Ponderosa* Pine stands in the cinder area near Sunset Crater, Arizona, were examined for dwarf mistletoe (*Arceuthobium vaginatum* f. *cryptopodum*). This volcano erupted ca. 900 years ago, and most of the *Ponderosa* Pine stands here have developed since. Stands with dwarf mistletoe constituted only ca. 1% of this area and were limited to its western edge, adjacent to heavily infested *Ponderosa* Pine stands on older volcanic soils where 37% of the area under Pine was infested. *From author's summary.*

3254. KUIJT, J. Morphological aspects of parasitism in the dwarf mistletoes (*Arceuthobium*). *University of California Publications in Botany, Berkeley, Calif.* 30 (5), 1960 (337-436 + 15 plates). 88 refs.

A general discussion of seed germination, seedling penetration, the development and morphological status of radicles and endophytic systems, the dynamics of broom formation and host/parasite interactions. Two main types of parasitism are distinguished: "isophasic", in which the endophytic system extends with the host system, the apical cells of the endophytic filaments frequently being embedded in the shoot apices of the host; and "anisophasic". A parasite may produce isophasic brooms (characterized by slight secondary hypertrophy, a decreased apical dominance, a regular pattern of shoot emergence that repeats itself annually, and frequently a vertical growth habit) on one host species but not on others. The differences in response are thought to be phenotypic rather than due to racial differentiation.

443. Fungi and Bacteria

See also Nos. 2791, 2796, 2798-2801, 3027, 3132-3, 3215-6, 3298, 3333.

3255. ROLL-HANSEN, F. Melding om sykdommer på skogstrærne i Norge i året 1959. [Report on diseases of trees in Norway in 1959.] *Medd. Norske Skogforsksk. v.* 16 (5), No. 57, 1960 (337-49). 2 refs. [Nor.e.]

3256. KORBONSKAYA, YA. I. [KORBONSKAJA, JA. I.] Mikologičeskaja flora arčevnikov central'noj časti Turkestanskogo hrebta. [The fungal flora of the Juniper forests of the central part of the Turkestan range.] *Trudy Botaničeskogo Instituta Akademii Nauk Tadžikskoj SSR* 73, 1958 (233-57). 6 pp. of refs. [Russ.] *From abstr. in Rev. appl. Mycol.* 39 (4), 1960 (249).

Fungi (155 species and forms) were collected from ground flora and trees during two expeditions. The main diseases of Juniper (*Juniperus turkestanica* and *J. semiglobosa*) were brown and white timber rots, which were prevalent on both the S. and N. slopes of the area. Mixed grass/Juniper stands were comparatively free. The dissemination and optimum development periods of *Fusarium* infection of Juniper seedlings were also studied. Seedlings in mixed grass suffered least. Most prevalent were the rust fungi (50 species in 6 genera), found mostly on the ground flora. Typical of the Juniper forests of the Turkestan range is *Gymnosporangium turkestanicum* (teleutospores on *J. turkestanica* and *J. semiglobosa*, aecia on *Sorbus tianschanica*). *Inonotus* (*Polyporus*) *heinrichii* was found on a rotted stump of *J. turkestanica*, and *Gloeophyllum abietinum* (*Polystictus abietinus*) on a brown-rotted stump of *J. semiglobosa*. The latter fungus is not known from Central Asia and is seldom found in the U.S.S.R.

3257. WHITE, L. T. Insects and diseases and the future of White Pine (*P. strobus*). *Timber of Canada* 21 (12), 1960 (44...49). 13 refs.

Notes on damage by and control of *Pissodes strobi*, *Fomes annosus*, *F. pini*, and *Cronartium ribicola*, and on new *Ribes*-killing chemicals.

3258. BARNETT, H. L. Special mechanisms for exposing fruit bodies of some wood-inhabiting fungi. *Abstr. in Proceedings of the West Virginia Academy of Science, Morgantown* 29, 1957 (1959), (33). O.R.S.

Endoconidiophora fagacearum, *Hypoxylon punctulatum* and *Poria obliqua* form their fruit bodies within the bark or wood. The production of special pressure cushions or ridges needed to crack or throw off the bark or wood, exposing the sporulating surfaces to disseminating agents, is described.

3259. VOLGER, C. Über die Entwicklung und Bedeutung systemisch antifungaler Verbindungen. [Development and importance of systemic antifungal compounds.] *Forstwiss. Cbl.* 79 (11/12), 1960 (346-52). 27 refs. [G.]

A review of European and N. American literature, covering the concepts of the subject, the development and search for systemic anti-fungal compounds, successes in controlling fungi with them, and

notes on the importance of development of systemic control of fungi harming forest trees.

3260. KLOMPARENS, W., and STRONG, F. C. **Plant disease control by the antifungal antibiotic Acti-dione.** *Trees Mag., Ohio* 21 (1), 1960 (6-9). 24 refs.

Reviews (with literature references) the use of Acti-dione to control *Cronartium ribicola*, *C. comptoniae*, *Gymnosporangium juniperi-virginianae*, *G. globosum*, *Entomosporium thuenenii*, *Coccomyces hiemalis*, *Dibotryon morbosum*, *Phomopsis juniperovora*, *Ovulina azaleae*, on trees and shrubs.

3261. LEMIN, A. J., KLOMPARENS, W., and MOSS, V. D. **Translocation and persistence of cycloheximide (Acti-Dione) in White Pines.** *For. Sci.* 6 (4), 1960 (306-14). 25 refs.

This antibiotic, known to be effective against active blister rust in Western White Pine, was sprayed basally on growing poles. It persisted for 2 years in the stem bark of Western White Pine and was recovered from the unsprayed needles of this and of the Eastern White Pine. Translocation appears to be confined to water-conducting elements. Dilutions of 120 and 200 p.p.m. of the standard 4% solution in No. 1 fuel (stove) oil were used.

3262. DIERCKS, R. **Zur chemischen Bekämpfung der Korbweiden-Parasiten *Fusicladium saliciperidum* (All. et. Tub.) Lind. und *Glomerella miyabeana* (Fuk.) v. Arx.** [Chemical control of the osier parasites *F. saliciperidum* and *G. miyabeana*.] *Pflanzenschutz, München* 11 (9), 1959 (125-31). 17 refs. [G.g.] L.S.

Following earlier tests with various fungicides, in which (a) Brestan (an organic Sn compound) had given best control and (b) Captan the highest yield of osiers, tests with (a/b) an equal mixture of (a) and (b) (0.3% in 300 litres water) and (c) zineb (0.4%) showed again best control and lowest yields for (a), with (c) giving least control and highest yields, and (a/b) intermediate in both respects, (a) being clearly somewhat phytotoxic and (b) and (c) probably growth-promoting. Results, except yields for (a), were better for weekly than for fortnightly sprayings. Financial results, viz. gross value of crop less costs of weekly treatment, were best for (a/b).

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 3256, 3260.

3263. SZONTAGH, P. **Bükk csemeték gomba okozta pusztulásáról és a védekezés módjáról csemetekertjeinkben.** [A *Phytophthora* infection of Beech seedlings and its control.] *Erdő* 9 (1), 1960 (4-6 + smries. in suppl.). [Hu.russ.g.]

An epidemic in a half-shaded nursery in a rainy spring was controlled by leading off excessive water, sterilizing the soil, and burning infected material, all helped by a good choice of nursery site.

3264. PAWSEY, R. G. **An investigation into *Keithia* disease of *Thuja plicata*.** *Forestry* 33 (2), 1960 (174-86 + 1 plate). 8 refs.

A description is given of infection by *K. thujina*

from the time of inoculation until the production of mature apothecia, including an account of the development of haustoria. Ascospores deposited on the surface of the foliage remain viable through the winter and are the main source of primary infection in the spring. The fungus is also carried through the winter in arrested stages of apothecial development termed incipient apothecia. It appeared that the ability of incipient apothecia to produce primary infection was very limited. Corroboration of field observations was given by experiments carried out in artificial low temperature conditions. *Author's summary.*

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 3256-8, 3426.

3265. RADZIJEV'SKYI, G. G. **Malovidomi gryby z rodu Polyporaceae na Ukrajinі.** [Little-known fungi of the family Polyporaceae in the Ukraine.] *Ukr. bot. Ž.* 17 (2), 1960 (107-8). 5 refs. [Ukr.] A.P.B.

Describes finds of *Poria taxicola* on fallen *Pinus sylvestris* twigs, *Trametes trogii* on living *Populus tremula*, and *Polyporus borealis* on rotten *Picea abies* stumps.

3266. ZAŠEV, B., and CANOVA, P. **Prinos kām izučavaneto na gābnata flora po stābloto i klonite na topolite v Bālgarija.** [The fungal flora of Poplar stems and branches in Bulgaria.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (237-46). 21 refs. [Bulg.g.]

Reports the finding of *Cytospora chrysosperma*, *C. nivea*, *Tubercularia vulgaris*, *Trametes hirsuta*, *T. gallica*, *Gloeoporus adustus*, *Peniophora polygonia*, *Cytidia flocculenta*, *Merulius papirinus* and *Schizophyllum commune*. None of these species, except *C. chrysosperma*, had been reported on Poplars in Bulgaria before, and *C. nivea*, *Tubercularia vulgaris*, *Trametes gallica*, *P. polygonia*, *C. flocculenta* and *M. papirinus* are new for Bulgaria. The site and age of the trees where the fungi were found, and the size, shape and colour of the fruiting bodies are noted.

3267. POMERLEAU, R. **Relation entre le développement des caries des conifères et le milieu.** [Relationship between the development of decay in conifers and the site.] *Abstr. in Ann. ACFAS* 24, 1958 (90). [F.] L.S.

A statistical analysis of data from two different sites shows that there are significant differences in the proportion of decayed to sound wood and in the volume increment of *Abies balsamea* according to the site. Trees growing on a *Dryopteris/Oxalis* site produced a gross merchantable volume 14.5% greater and a net merchantable volume 24.7% greater than trees growing on a *Hylocomium/Oxalis* site.

3268. HINDS, T. E., HAWKSWORTH, F. G., and DAVIDSON, R. W. **Decay of Subalpine Fir [*Abies lasiocarpa*] in Colorado.** *Sta. Pap. Rocky Mt.*

For. Range Exp. Sta. No. 51, 1960. pp. 13. 11 refs.

Information on decay in Subalpine Fir was obtained by dissecting 319 trees on 16 plots in Colorado. Decay for all trees of >9.5 in. d.b.h. was 35% on a bd.-ft. basis and 9.9% for cu. ft. There was an irregular relationship between decay and age. Decay increased with age to a peak in the 150- to 200-year age class, then declined with age to a minimum in the 250- to 300-year age class, and increased again with advancing age to a second peak in the 350- to 400-year age class. The decline in decay in trees after 200 years may be due to the death (possibly through wind breakage or wind-throw) of the more decadent trees. There was no apparent relationship between decay and site quality. The fungi associated with about 58% of the decay volume were identified. *Stereum sanguinolentum* was by far the most important, followed by *Fomes pini*. In all, 18 fungi were isolated—6 from stem and 12 from butt rots. None of the decay fungi consistently fruit on living trees, and there are no consistent external indicators of decay. However, broken tops and stem wounds were usually indicative of extensive decay. *From authors' summary.*

3269. MIŠIN, P. A. O sniženii vozrasta rubki dlja pihty sibirskoj (*Abies sibirica*) v svjazi s zaraženost'ju ee gnijljamj vyzyvaemymi gribami. [Reducing the felling age for *A. sibirica* in relation to rot damage caused by fungi.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (46–52). [Russ.]

Investigations in virgin stands in the W. Altai have shown that the Fir is severely damaged by fungi (the worst being *Fomes annosus*), that the degree of damage is directly related to age, and that the higher the site class the greater is the damage. Rot first occurs at 40–50 years, and at 100 years can affect 30–70% of the stand. As fungal damage in stands of age-class V causes timber losses twice as great as the mean stand increment, felling at 70–80 years is recommended. [Cf. *F.A.* 21 No. 1993.]

3270. BAGCHEE, K. The fungal diseases of Sal (*Shorea robusta* Gaertn.). Part II. Secondary parasites of Sal. *Indian For. Rec. (n.s.) Mycology* 1 (8), 1954 (1960), (97–184 + 39 plates). 56 refs.

[Cf. *F.A.* 21 No. 4576.] Describes the biology of 18 hymenomycetous fungi, 3 Agaricaceae, 14 Polyporaceae, and one Thelephoraceae, which attack Sal trees in the forest, causing sap- and heart-rot. The pathology and the diagnostic and cultural characters are given in detail. Eight other, facultative, parasites are referred to, and their cultural characters given for comparison.

3271. GIBSON, I. A. S., and GOODCHILD, N. A. *Armillaria mellea* in Kenya forests. *E. Afr. agric. For. J.* 26 (2), 1960 (142–3). 4 refs.

[Cf. *F.A.* 21 No. 3350.] Tabulates the number of trees found with rhizomorphs in linear surveys of 13 areas of highland forests. All common species carried them, the frequency of the association varying directly with rainfall. The Bamboo *Arundinaria alpina* also carries these epiphytic rhizomorphs.

3272. AZEVEDO, N. F. DOS SANTOS DE. O "brocado" dos povoamentos de *Cryptomeria japonica* D. Don na Ilha de S. Miguel. [*Armillaria mellea* in *C. japonica* stands on the island of S. Miguel.] *Estud. Inform. Serv. Flor. Açúic. Portugal* No. 124-D3, 1960. pp. 43 + 4 plates + 1 map. 17 refs. [Port.] Limited distribution.

A root disease of *C. japonica* in São Miguel (Azores) was identified as *A. mellea*. The results are presented of a survey of the general state of health of trees in nurseries and in various forest stands throughout the island, and control and preventive measures are outlined.

3273. RAYNER, R. W. Root rot of coffee and ring-barking of shade trees. *Kenya Coffee, Nairobi* 24 (285), 1959 (361–5). I.M.I.

Discusses the fungi causing root-rot (mainly *Armillaria mellea* and *A. tabescens*) and methods of control. These include ring-barking of shade trees before felling, and recommended methods are described.

3274. BOULLARD, B. Étude d'une attaque 'l'*Armillariella mellea*' (Vahl) Qué. sur l'épicéa de Sitka: biologie du parasite, moyens de lutte. [An attack of *Armillaria mellea* on Sitka Spruce: biology of the parasite and control methods.] *Rev. for. franç.* 13 (1), 1961 (16–24 + 4 photos). 12 refs. [F.]

Describes an attack on a 15-year-old plantation of Sitka in Normandy, and discusses possible control measures; also briefly reviews the literature on the biology of the fungus.

3275. DENYER, W. B. G. Cultural studies of *Flammula alnicola* (Fr.) Kummer and *Flammula conissans* (Fr.) Gillet. *Repr. from Canad. J. Bot.* 38 (6), 1960 (909–20 + 2 pp. of photos). 14 refs.

A fungus isolated from a yellow, stringy decay of *Picea glauca*, *Tsuga heterophylla*, and other conifers in W. Canada, and thought to be *F. conissans*, was identified as *F. alnicola* after comparison with an authentic isolate of *F. conissans* from Europe. Basidiospores of *F. alnicola* germinated after cold treatment at -7°C . The requirement of moderate cold treatment for spore germination may account for the occurrence of the fungus only as a root-rot pathogen.

3276. WALLIS, G. W. Survey of *Fomes annosus* in East Anglian Pine plantations. *Forestry* 32 (2), 1960 (203–14). 17 refs.

The incidence of mortality from *Fomes annosus* in first-rotation crops was studied in relation to some soil characteristics and forest management. Mortality was closely correlated with soil reaction in the major lateral rooting zone, extensive damage occurring only on areas of pH > 6. Neither soil reaction at 50 cm. nor soil depth was correlated with root-rot losses under the conditions of this survey. Losses were high on agricultural land only where the addition of lime had raised the soil reaction above pH 6. Damage was severe in many stands growing on calcareous grass-heath with a naturally high pH. Losses were erratic in young stands, but became more

uniform by the age of 30 years. Disease incidence increased in proportion to the number of thinnings, only where the soil pH was >6 . Losses from *F. annosus* in pure Corsican Pine were relatively low compared with those in Scots Pine. *From author's summary.*

3277. DUE, J. E., and YDE-ANDERSEN, A. Lærkeammetræs og *Fomes annosus*-angreb i gran. [Larch nurse trees and *F. annosus* attack on Spruce.] *Dansk Skovforen. Tidsskr.* 45 (12), 1960 (566-79). 4 refs. [Dan.e.e.]

Adjacent Spruce stands, planted with or without Larch nurses (felled some years before the study), were examined. The number of trees attacked by *F. annosus* was significantly higher where Larch had been present, victims being most frequent among Spruce with roots in contact with those of Larch stumps. The attack probably originates from infection of the stumps by airborne *Fomes* spores, and treatment of Larch stumps with creosote immediately after felling is recommended [cf. *F.A.* 22 No. 722].

3278. MIKALAIKEVIČIUS, V. Kovos priemonės su centriniu drebulės puvinium. [Control of heart rot in Poplars.] *Liet. Miškų ūkio Moksl. Tyr. Inst. moksl.-tech. inform. biul.* No. 1, 1959 (13-4). [Lith.]

The chief species in Lithuania, *Phellinus tremulae* [*Fomes igniarius* f. *tremulae*], does not spread via the roots, so that wildlings can be used as well as seed. Control measures include choice of sites of high fertility, not previously infected, and free from injury by game or domestic stock; poison girdling of badly affected trees; winter fellings (to prevent spread by spores); and cutting out of all dead branches from crowns. [Cf. *F.A.* 21 No. 4575.]

3279. YDE-ANDERSEN, A. Om angreb af *Polyporus schweinitzii* Fr. i nåletræbevoksninger. [Attack by *P. schweinitzii* in conifer plantations.] *Dansk Skovforen. Tidsskr.* 46 (1), 1961 (26-38). 20 refs. [Dan.dan.]

A review, describing the fungus, and discussing its distribution and species attacked, symptoms and damage in individual trees and stands, methods of infection, and damage to timber.

3280. NEWHOOK, F. J. Climate and soil type in relation to *Phytophthora* attack on Pine trees. *Proc. N.Z. Ecol. Soc.* No. 7, 1960 (14-5). 2 refs. [Cf. *F.A.* 21 No. 637.]

Wilts, Diebacks etc.

See also No. 3258.

3281. IVANCHENKO, YU. N. [IVANČENKO, JU. N.]. O pričina ushyanija duba nasaždenij Lipeckoj dači Saval'skogo lesničestva. [The causes of Oak wilt in the Lipetsk range of the Savala forest.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* 8, 1957 (221-5). [Russ.] From *abstr.* in *Rev. appl. Mycol.* 37 (12), 1958 (742).

Ophiostoma roboris, *O. valachicum*, *O. kubanikum* and *Fusarium* sp. were isolated from wilted Oaks. Their pathogenicity was established by inoculation.

Typical wilt occurred only in trees inoculated with all 4 fungi. Isolation of the fungal complex from parts damaged by *Scolytus intricatus* indicated that it is a carrier.

3282. POTLAYCHUK [POTLAJČUK], V. I. K biologii vzbuditelja, vyzvajuščego usyhanie duba. [On the biology of the causal agent of Oak wilt.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* 8, 1957 (227-37). [Russ.] From *abstr.* in *Rev. appl. Mycol.* 37 (12), 1958 (742).

In investigations begun in 1954, a relationship was established between the complex of fungi causing Oak wilt in the Black Sea region and the Moldavian S.S.R. (*Ophiostoma* and *Ceratostomella* spp.) and similar species attacking Elm. Isolates from the two hosts were pathogenic on cross-inoculation, and such transmission is very common in nature. Infection is carried on acorns.

3283. HOUSTON, D. R., and KUNTZ, J. E. The effect of temperature and moisture on Oak wilt development. *For. Res. Note Wis. Coll. Agric.* No. 67, 1960. pp. 3. 8 refs.

A paper previously noticed in abstract form [see *F.A.* 22 No. 2037].

Cankers, Stem Rusts etc.

See also Nos. 3257-8, 3260-2, 3266.

3284. ANDERSON, N. A. Studies on the effects of the *Cronartium* rusts on Jack Pine and epidemiology of these fungi. *Abstr. of thesis, in Dissert. Abstr.* 21 (4), 1960 (721). O.R.S.

C. comptoniae, *C. quercuum*, *C. coleosporioides* [cf. *F.A.* 21 No. 3370] and *C. comandrae*.

3285. SNOW, G. A. Spraying before rains important for fusiform rust control. *Tree Plant. Notes* No. 43, 1960 (17-8). 2 refs.

The experiment was designed to determine whether spraying nursery beds of Slash Pine with ferbam before the onset of conditions favourable for fusiform rust infection (prolonged periods of rain and high humidity) is better than spraying afterwards. The amount of rust that developed was markedly less on seedlings sprayed before inoculation (4-8%) than on those sprayed after (38-63%). The amount of infection in inoculated, unsprayed seedlings was 73%.

3286. PETERSON, R. S. Western gall rust on hard Pines. *For. Pest Leaflet U.S. For. Serv.* No. 50, 1960. pp. 8. 3 refs.

Peridermium harknessii causes stem cankers and branch galls, particularly on *Pinus contorta*, *P. ponderosa*, and *P. sabiniana*, from Mexico to Alaska. The morphology, life history and ecology of the pathogen are described and control measures recommended.

3287. PETERSON, R. S. Development of western gall rust in Lodgepole Pine. *Phytopathology* 50 (12), 1960 (876-81). 13 refs.

Peridermium harknessii is a damaging parasite of Pines in the western U.S.A., especially of Lodgepole Pine. The host cambium is stimulated to produce galls that contain more than 5 times the normal %

of ray parenchyma. There is a high correlation between rust and host growth rate: lateral advance of the rust from the edges of stem cankers is, on the average, about twice the host's annual radial increment. This rate is usually insufficient to girdle and kill trees quickly, so that live rust mycelia 200 years old are not uncommon. *From author's summary.*

3288. OGANOVA, È. A. O bakteriā'nom rake jasenja. [Bacterial canker of Ash.] *Soobšč. Inst. Les. No. 8, 1957 (81-9). 2 refs. [Russ.]*

From observations in the Tellerman forest, describes symptoms, the pathogen (*Pseudomonas savastanoi* var. *fraxini*), frequency and severity of attack, and control. [Cf. *F.A.* 20 No. 3340.]

3289. PENO, M. Novozapažena patološka pojava na topolama. [A newly observed pathological phenomenon on Poplars.] *Topola, Beograd 3 (10), 1959 (872-3). [Serb.]*

Describes the symptoms of an unidentified bark necrosis attacking 1- and 2-year-old sets of *Populus* × *robusta* and *P.* × *serotina* in at least two areas in Yugoslavia. Laboratory studies on the physiology of the pathogen are outlined.

3290. PENO, M. Pojava nove gljivice na topoli. [The occurrence of a new fungus on Poplar.] *Topola, Beograd 4 (13/14), 1960 (13-4). 1 ref. [Serb.]*

The cause of a new bark necrosis of Poplar [see preceding abstract] has been identified as *Chaetomella tortilis* (Sphaeropsidales), which normally lives in the soil as a saprophyte. Its pathogenicity is considered to be the result of abnormal soil conditions (soil exhaustion, inadequate water regime, etc.). Further details of its physiology and life history are given.

3291. MÜLLER, E., and SANWAL, B. D. On a new parasitic fungus on *Castanopsis*. *Indian Phytopathology, New Delhi 12 (1), 1959 (29-32). 11 refs. I.M.I.*

Microstroma castanopsis sp. nov. on *Castanopsis tribuloides*.

Foliage Diseases

See also Nos. 3256, 3260, 3262.

3292. GOOSSEN, H. Auftreten und Bekämpfung der Kiefernscütte (*Lophodermium pinastri* Chev.) in den Jahren 1954-1959 in Westfalen/Lippe. [Occurrence and control of *L. pinastri* in Westphalia/Lippe during 1954-59.] *Gesunde Pflanzen, Frankfurt-am-Main 12 (6), 1960 (125-33). [G.] O.W.*

Reports on control measures, with particular reference to aerial sprays of zineb in 1957 and 1958, with information on methods used, dosages and results.

3293. BRANDT, R. W. The *Rhabdocline* needle cast of Douglas-Fir. *Tech. Publ. N.Y. St. Coll. For. No. 84, 1960. pp. 66. 73 refs. Price \$0.80.*

A study of *R. pseudotsugae* needle-cast in central New York, with a general account of the biology of the pathogen, histopathological studies of the

anatomy of healthy and diseased needles, and an investigation of the role of Lammas shoots in relation to the disease.

3294. MÜLLER, E., and BHOSE, S. K. Über eine Erkrankung an *Taxus* im Himalaya. [A disease of *Taxus* in the Himalayas.] *Indian Phytopathology, New Delhi 12 (1), 1959 (13-8). 4 refs. [G.e.] I.M.I.*

Diseased trees of *T. baccata* subsp. *wallichiana* in the eastern Garhwal region were found to be attacked by *Asteridiella taxi* and *Chaetothyria negii* sp. nov., described and illustrated, both found on living leaves.

3295. ŠARIĆ, A., and MILATOVIĆ, I. Pokus suzbijanja rde topola u šumskom rasadniku Banova Jaruga. [A trial of Poplar rust control in the Banova Jaruga forest nursery.] *Šum. List 84 (9/10), 1960 (290-1). 6 refs. [Croat.e.]*

Trials for the control of *Melampsora alii-populina* and *M. larici-populina* were carried out on plots containing various groupings of 10 Poplar species and clones in the Lipovljani forest district. Twenty-four plots were sprayed thrice at the end of May, June and July, with (a) 1% CuOCl₂ and another 24 with (b) 0.3% Dithane [zineb-type]; 24 plots were left unsprayed (c) as controls. Examination in September showed that (a) had given complete protection from rust, but (b) was almost useless, both the (b) and (c) plots being seriously damaged.

3296. JOSHI, L. M., and REDDY, A. R. Some observations on *Uromyces indigoferae* Diet. & Hohnw., the rust of *Indigofera linifolia* Retz. *Indian Phytopathology, New Delhi 12 (1), 1959 (25-8). 4 refs. I.M.I.*

3297. SARKAR, A. Leaf spot disease of *Mangifera indica* L. caused by *Pestalotia mangiferae* Butl. *Lloydia 23 (1), 1960 (1-7). 4 refs. P.R.*

Describes the morphology of the fungus on the host and gives details of studies made on several cultural media, tabulating data obtained for the growth and sporulation of *P. mangiferae* in media containing various carbohydrates or N compounds, and indicating the effect of temperature on spore germination. The results of pathogenicity tests are included, showing the varietal resistance of *M. indica* to the fungus.

45. Damage by Animals

3298. JAHN, E. Schädlingsauftreten an der Wald- und Baumgrenze in den österreichischen Alpen und dagegen zu ergreifende Massnahmen. [Diseases and pests occurring near the forest and tree line in the Austrian Alps, and their control.] *Praktische Chemie, Wien 10 (6), 1959 (220-2). 5 refs. [G.] L.S.*

Briefly discusses their upper limits of occurrence on conifers. Though bark beetles and borers are common in timber on the ground up to 2000 m., the damage to standing trees becomes important only after storm and avalanche disasters, particularly on south slopes. The soil compaction caused by animals on the frequently overstocked mountain pastures is also discussed.

451. Mammals

See also Nos. 3070, 3215-6, 3298.

3299. CAYFORD, J. H., and HAIG, R. A. Mouse damage to forest plantations in southeastern Manitoba. *J. For.* 59 (2), 1961 (124-5). 1 ref.

Considerable damage resulting from field mice (*Microtus pennsylvanicus*) gnawing the bark of the stem and lower branches was noted in 1959 in conifer plantations established in 1946-55. *Pinus sylvestris* was the most susceptible species, *P. banksiana* intermediate, and *P. resinosa* and *Picea glauca* were undamaged. The mice were capable of girdling even the largest trees sampled. Severe damage was confined to sites supporting a moderate to dense grass and shrub cover; susceptible species should not be planted on such sites unless treatment to reduce cover density is applied. [Cf. *F.A.* 8 No. 2731.]

3300. DINESMAN, L. G. Vrednaja dejatel'nost' mlekopitajščih i ptic i zaščita ot nih drevosno-kustarnikovyh nasaždenij. [The damage caused by mammals and birds, and protection of trees and shrubs from them.] *Soobšč. Inst. Les.* No. 8, 1957 (33-43). 1 ref. [Russ.]

Deals with the results of an investigation into damage in various parts of European Russia from autumn 1952 to autumn 1953, discussing separately damage caused by: ungulates—*Sus scrofa*, *Saiga tatarica*, *Cervus elaphus*, *Capreolus capreolus*, *Alces alces*; rodents—*Lepus* spp., Muridae, etc.; carnivores—isolated instances of damage by *Meles meles* and *Vulpes vulpes*; birds—*Garrulus glandarius*, *Streptopelia turtur*, *Emberiza* spp., *Chloris chloris*, etc. It is considered that more accurate and detailed recording of damage will make it possible to predict danger and facilitate preventive or remedial action.

3301. KOZLOVSKIJ, A. A. Ochrana lesa ot povreždenij losjami. [Protecting the forest from elk damage.] *Vsesojuznyj Naučno-issledovatel'skij Institut Lesovodstva i Mehanizacii Lesnogo Hozjajstva*, Moscow. 1960. pp. 58 + 4 forms. 31 refs. [Russ.] B.A.P.

[Cf. *F.A.* 21 No. 3395.] Discusses the numbers and distribution of elk [*Alces alces*] in the Moscow region, elk ecology, assessment of the damage they do in forestry, food productivity on their winter feeding grounds, determination of their optimum numbers in leskhozes, methods of protecting stands from damage, and determination of elk numbers. An appendix summarizes the steps in an elk regulation programme (including the use of aerial counts).

3302. CSÉSZNÁK, E. Vadkár elhárítás a Pilisben. [Protection against game in the Pilis mountains.] *Erdő* 8 (7), 1959 (257-60 + smries. in suppl.). [Hu.russ.g.]

Studies in conifer plantations showed that to exclude red deer, fencing should be ≈ 2.5 m. high and enclose ≈ 10 -15 ha. Terminal buds are better protected with ordinary paper than with glass wool, but most surely by bending them down and fixing them to the ground with a forked branch or wire hook. Smearing with repellents is ineffective because it does not hide the attractive green colour.

452. Birds

See also Nos. 3026, 3047, 3300.

3303. TURČEK, F. J. Gedanken über die selektive Nahrungswahl von Waldsamen durch den Kernbeisser und die Tannenmeise. [Forest-seed preferences of the hawfinch and coal tit.] *Waldhygiene* 3 (8), 1960 (246-51). 3 refs. [G.g.]

Describes tests with a captive hawfinch fed with mixtures of seeds of conifers and hardwoods and a captive coal tit, fed with conifer seeds only. The preferences were not always in accordance with known feeding habits in the natural state, e.g. the tit refused the seeds of Silver Fir, concentrating on softer seeds.

3304. HAFTORN, S. The proportion of Spruce seeds removed by the tits in a Norwegian Spruce forest in 1954-55. *Det Kongelige Norske Videnskabers Selskabs Forhandling, Trondheim* 32, 1959 (1960), (121-5). 2 refs. [E.] P.O.

[Cf. *F.A.* 20 No. 2944.] Tabulated results of observations show the average number of seeds taken per hour by different tit species, the number of tits in the study area, and the total number of seeds taken by all species in the autumn of 1954. The total weight of seeds taken in autumn to spring is estimated at 36.4 kg. or 0.7% of the total seed produced.

453. Insects

See also No. 3027.

3305. BAKKE, A. Melding om insektskader på skogstræne i Norge i året 1959. [Report on insect damage to trees in Norway in 1959.] *Medd. Norske Skogforsøksv.* 16 (5), No. 57, 1960 (353-9). 2 refs. [Nor.e.]

3306. ACATAY, A. Über einige Zedernschädlinge in der Türkei. [Some pests of *Cedrus libani* in Turkey.] *Anz. Schädlingsk.* 34 (1), 1961 (1-6). 10 refs. [G.]

Presents short notes on the following pests: *Buprestis cupressi*, *Chrysobothris solieri*, *Magdalis violacea*, *Phloeosinus acatayi*, *Ips erosus*, *Crypturgus cinereus*, *Acalla undulana* and *Barbara osmana*.

3307. STARK, V. N. Značenie ol'govyh nasaždenij v formirovanii fauny stvolovyh vreditelej lesnyh posadok lesostep'ja. [Importance of Alder stands as a source of stem pests of plantations in the forest-steppe zone.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (191-204). [Russ.] B.A.P.

Lists 34 species of stem-damaging insects found in the natural *Alnus glutinosa* stands of the Voronezh region. Only 4 of them are specific to the Alder; 21 also attack Oak, 16—Birch, 11—Poplars, 13—Willows, 10—Elms and Maples, 8—Lime, and 3—Hazel. Data are given on population densities, distribution in the stem, vertical flight zones, etc., for the more important species.

3308. MORAVSKAJA, A. S. Povreždaemost' nasekomymi rano- i pozdnoraspuskajuščihsa form duba i il'movyh porod. [Insect damage to early- and late-flushing forms of Oak and species of Elm.]

Soobšč. Inst. Les. No. 8, 1957 (44-63). 27 refs. [Russ.russ.]

Investigations were made in the Tellerman forest into the species and numbers of insects damaging (a) *Quercus robur* var. *praecox*, which flushes 20-30 days before (b) *Q. r.* var. *tardiflora*. Species causing damage were the same, but (a) was more heavily damaged than (b) by early-hatching insects. Early and late forms of *Ulmus laevis* and *U. campestris* were also observed, but as there was a difference of only 7-14 days between early- and late-flushing forms, the latter suffered as much as or more than the former from early-hatching insects. The ♀s of *Exapate congelatella* and *Operopthera brumata* do not differentiate between early- and late-flushing forms of Oak or Elm when laying their eggs.

3309. LAMB, K. P. A check list of New Zealand plant galls (zoecocidia). *Trans. Roy. Soc. N.Z.* 88 (1), 1960 (121-39). 25 refs. O.R.S.

Lists the known zoecocidia of New Zealand. Plant species are arranged systematically with an alphabetical index.

3310. ROSS, D. A. A list of cone and seed insects of interior British Columbia. *Proceedings of the Entomological Society of British Columbia, Vancouver* 55, 1958 (30-1). I.I.E.

Lists over 30 insects on 9 hosts.

3311. YLI-VAKKURI, P. Siementen tuhoutumista kulotetuilla alueille. [The destruction of seed on forest burns.] *Metsät. Aikak.* 1960 (12), (451-2). [Fie.]

Reports on experiments showing that seed eaters can completely, or almost completely, destroy Pine and Spruce seeds on the burnt-over humus surface of recent burns, early in the growing season. The agents were not fully determined, but one may be a carabid, *Pterostichus vulgaris*. The viability of seeds on the burnt-over surface remained practically unchanged for 3 weeks, but fell considerably in 6 weeks, and had disappeared completely by the end of the growing season. *From author's summary.*

3312. PANŠINA, E. I. Opylivanie, kak metod absoljutnogo količestvennogo učeta členistonogih v kronah derev'ev. [Dusting as a method of absolute quantitative determination of the numbers of arthropods in tree crowns.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 14, 1960 (43-50). 5 refs. [Russ.russ.] B.A.P.

Heavy dosages of 12% BHC dust were applied to individual sample trees in pure Scots Pine stands in the Savala district of the Voronezh region, and the dead insects (mainly *Bupalus piniarius*) collected and counted. This method was checked by a second dusting, by examination of the felled tree, or by examination of sample branches, and found to be extremely accurate.

Insects: Natural and Biological Control

See also Nos. 2733, 3215, 3325-6, 3332, 3334, 3337, 3344-5, 3349, 3351-62, 3371-2, 3402-4, 3406, 3409-10, 3414-5, 3417.

3313. SMITH, K. M. Some factors in the use of pathogens in biological control with special reference

to viruses. *Report, 7th Commonwealth Entomological Conference, London 1960* (111-8). 20 refs.

Reviews work on control of insect pests, including *Neodiprion sertifer* and *Lymantria dispar*, and lists a number of pests for which viruses have been found.

3314. ROMANYK, N., and RUPEREZ, A. Principales parásitos observados en los defoliadores de España con atención particular de la *Lymantria dispar*. [The chief parasites observed in defoliators in Spain, particularly in *L. dispar*.] *Entomophaga* 5 (3), 1960 (229-36). 13 refs. [Span.f.] O.H.

Discusses the importance of the chief defoliators, damage done etc. and lists parasite complexes, with notes on degrees of parasitization, of *Tortrix viridana*, *Lymantria dispar*, *L. monacha*, *Malacosoma neustria*, *Thaumetopoea pityocampa*, *Catocala nymphaeophaga* and *Ephesia nymphae* (both defoliators of *Quercus* spp.). Biological control, by parasites, of *T. pityocampa*, *Diprion pini* and *L. dispar* is briefly discussed.

3315. MAYER, K.; QUEDNAU, W. Das *Trichogramma*-Problem. [The problem of *Trichogramma*.] *Mitt. Biol. Bundesanst. Land- u. Forstw., Berl.* No. 100, 1960. pp. 50. 112 refs. [G.g.e.]

The first article, "Behaviour studies in the genus *Trichogramma*," reviews the influence of abiotic factors, and of hosts and their food plants on behaviour, size, bionomics, etc.; the second, "The identity of *Trichogramma* species and some of their ecotypes," describes laboratory methods of analysis of population complexes and discusses 11 individual species, with a key.

3316. KADOČNIKOV, N. P. Materialy po pitaniyu gnezdovyh ptencov nasekomojadnyh ptic Savalskogo lesničestva Voronežskoj obl. i ocenka ih s točki zrenija leschozajstvennogo značeniya ptic v gnezdovoj period. [On the food of nestlings of insectivorous birds in the Savala forest district, Voronezh region, and assessing the silvicultural importance of birds in the nesting period.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (225-317). 25 refs. [Russ.] B.A.P.

From studies in plantations, mainly Scots Pine and Oak, but also some other hardwoods, data are tabulated for ≥2 seasons in the period 1951-55, on the numbers and species of insects (and also reptiles, birds' eggs, etc. in some cases) eaten by nestlings of *Coracias garrulus*, *Dryobates major*, *Jynx torquilla*, *Corvus corone*, *Pica pica*, *Sturnus vulgaris*, *Emberiza hortulana*, *Parus major*, *P. caeruleus*, *Lanius cristatus*, *Muscicapa albicollis*, *Sylvia borin*, *S. atricapilla*, *Turdus ericetorum*, *T. merula*, and *Phoenicurus phoenicurus*. All, except *C. corone*, were silviculturally useful in varying degrees, and all, except *J. torquilla*, ate a wide assortment of insect species. Some of the more noticeable features were the active feeding of: *P. major* on larvae of *Evetria* sp., *Dendrolimus pini*, *Lymantria dispar*, etc.; *P. major*, *M. albicollis*, *P. phoenicurus* and *E. hortulana* on adults of *Bupalus piniarius*; *S. vulgaris* on larvae and pupae of *Tortrix viridana*; *D. major* on larvae of *Diprion*

pini; and *P. pica*, *D. major*, *T. ericetorum*, *T. merula*, *S. vulgaris* and *L. cristatus* on *Melolontha hippocastani*.

Insects: Silvicultural Control

See Nos. 3327, 3347, 3359, 3368, 3379, 3384.

Insects: Chemical Control (General)

See also Nos. 3215-6, 3327, 3329, 3331, 3338, 3340-1, 3360, 3365, 3370-1, 3373-4, 3380-1, 3384, 3388-9, 3394, 3397, 3399, 3404, 3418.

3317. GRUCH, W., and STEINER, P. Zur Toxikologie der Insektizide. Literaturübersicht. 2. Teil: Toxaphen-Gruppe. [The toxicology of insecticides: a review of the literature. Part II. The toxaphene group.] Mitt. Biol. Bundesanst. Land- u. Forstw., Berl. No. 102, 1960. pp. 64. 9 pp. of refs. [G.]

[Cf. F.A. 21 No. 2057.] Part II covers, in a similar manner, toxaphene and Strobilan.

3318. NORRIS, D. M. Systemic insecticidal action in the cortical tissues of Elm twigs. *J. econ. Ent.* 53 (6), 1960 (1034-6). 3 refs.

Assay with *Scolytus multistriatus* showed that stem implantation of 6 and 18 g. respectively of two vinyl phosphates containing carboxamide groupings (i.e. Shell 3562 and phosphamidon) inhibited the formation of feeding niches >3 mm. long for 15 and 29 days.

3319. WOODWELL, G. M. Persistence of DDT in forest soils. *Abstr. in Bull. Ecol. Soc. Amer.* 41 (3), 1960 (88). A.P.B.

Analyses of soils from sprayed Spruce/Fir stands indicate that the *o-p*-isomer of DDT is much more persistent than the *p-p*-isomer. Residues of the former, sprayed at a rate of $\frac{1}{2}$ lb. technical grade DDT/acre, persisted in the soil for at least 5 years.

3320. GORHAM, J. R. Fluctuations in aquatic insect populations associated with aerial applications of DDT to northern Maine forests. *Abstr. of thesis, in Dissert. Abstr.* 21 (4), 1960 (716-7). O.R.S.

Studies in 1958-59, after aerial spraying in June 1958, showed reductions in all populations by ca. 40-60%. Recovery was, however, fairly rapid. Loss of potential trout food was moderated by pre-spray feeding, survival of many trout-food invertebrates, etc.

3321. BEYE, F., KAESER, W., and BUCHNER, R. Zur Wirkung von Aktivsubstanzen verschiedener Insektizide auf Bienen. II. Mitteilung. [The effect on bees of the active principles of different insecticides. Part II.] *Anz. Schädlingsk.* 32 (8), 1959 (121-3). 5 refs. [G.g.]

Nine insecticides in (1) acetone and (2) "Emulsion 21" of Geigy Ltd. were tested on bean leaves for their effect on bees. Those in (1) had a markedly adverse effect; with (2), particularly for short periods of contact, only diazinon and parathion proved harmful. [Cf. F.A. 20 No. 4842.]

3322. BEYE, F., KAESER, W., and BUCHNER, R. Zur Wirkung von Aktivsubstanzen verschiedener

Insektizide auf Bienen. III. Mitteilung. Lipidgehalt von Bienen nach Kontaktbehandlung und dessen Wirkung auf *Drosophila* im Biotest. [The effect on bees of the active principles of different insecticides. Part III. Content of lipid substances in bees after contact, and their effect on *D. melanogaster*.] *Anz. Schädlingsk.* 34 (2), 1961 (26-8). 6 refs. [G.g.]

Bees (1) having had contact and (2) without contact with insecticides were extracted with 3 different solvents and the extractives tested for their action on *Drosophila melanogaster*. The results are presented. Acetone extracts were generally more toxic than chloroform or ethyl-alcohol extracts.

Isoptera

3323. SANDS, W. A. Termite control in West African afforestation [with discussion]. Report, 7th Commonwealth Entomological Conference, London 1960 (106-10).

A review of control methods tested by the Colonial Termite Research Unit.

Hemiptera

See also Nos. 2722-3.

3324. ANIČKOVA, P. G. Issledovanie pričín, vliyajuščih na izmenenie sostava populacii sosnovogo podkorovogo klopa (*Aradus cinnamomeus* Panz.) v uslovijah Saval'skogo leshoza Voronežskoj obl. [Reasons for changes in the composition of the *A. cinnamomeus* population in the Savala leshhoz, Voronezh region.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (177-90). 5 refs. [Russ.russ.] B.A.P.

Investigations were made in pure Scots Pine plantations of various ages up to 50, on the two forms of the ♀ of *A. cinnamomeus*, i.e. (a) the long-, and (b) the short-winged form. The formerly held opinion that worsening environmental conditions cause an increase in the % of (a) was not confirmed; form (a) played the main part in the formation of new foci of infestation and the % of this form increased with increasing light. Some data are also given on the effects of *A. cinnamomeus* on tree increment and physiology.

3325. SCHLINGER, E. I., and HALL, J. C. Biological notes on Pacific coast aphid parasites, and lists of California parasites (Aphidinae) and their aphid hosts (Hymenoptera: Braconidae). *Ann. Ent. Soc. Amer.* 53 (3), 1960 (404-15). 25 refs. O.R.S.

3326. BROWN, N. R., and CLARK, R. C. Studies of predators of the Balsam woolly aphid, *Adelges piceae* (Ratz.) (Homoptera: Adelgidae) VIII. Syrphidae (Diptera). *Repr. from Canad. Ent.* 92 (11), 1960 (801-11). 10 refs.

Gives descriptions for field identification of *Syrphus torvus*, *Metasyrphus lapponicus* and *Neocnemodon coxalis*, and presents data on their life history and habits, parasitization by Hymenoptera, population fluctuations and control value. In general, they can reduce the rate of increase of *A. piceae*, but cannot reverse the upward trend of the adelgid population in the summer generation, unless other controlling factors are operating. Brief notes are

included on other syrphids found on infested Balsam Fir.

3327. BUTCHER, J. W., and HAYNES, D. L. **Chemical control of Eastern Spruce gall aphid with observations on host preference and population increase.** *J. econ. Ent.* 53 (6), 1960 (979-82). 5 refs.

Lindane (1 lb. active principle/100 gal. water), the best of 5 insecticides tried, gave good control when sprayed between the last frost and first shoot elongation. In mixed stands, *Picea glauca* had 15% more stems attacked than *P. abies*. The 1959 infestation increased by 6% over that of 1958. A strong tendency to re-infest the same trees suggests a method of reducing the pest by harvesting these trees first, even though they fetch lower prices as Christmas trees.

3328. JULIN, E. **The distribution of the Spruce gall aphids *Sacchiphantes abietis* and *Adelges laricis* in Sweden (Hem. Aphid.).** Repr. from *Opuscula entomologica*, Lund 24 (3), 1959 (167-75). 24 refs. [E.f.]

Both galls are found on Spruce all over Sweden, but those of *S. abietis* are rare in the north. In the south, where they are common, they are found more often near villages and settlements. In general, they seem to prefer open biotopes. From author's summary.

3329. PETERSEN, B. B. Sitkalusen. [***Neomyzaphis abietina***.] *Dansk Skovforen. Tidsskr.* 45 (11), 1960 (511-26). 19 refs. [Dan.dan.e.]

Outbreaks in Denmark over the last 40 years have followed mild winters. This knowledge permitted the prediction of an outbreak in 1959 early enough for successful control by spraying in May with 0.5 kg. Metasystox in 35 litres water/ha. In Denmark, defoliation causes some loss of increment but little mortality.

3330. TAKAHASHI, R. ***Stomaphis* of Japan (Aphididae, Homoptera).** *Bulletin, University of Osaka Prefecture, Osaka (Ser. B)* 10, 1960 (1-8). [E.] L.S.

Includes the following: *S. (Neostomaphis) fagi*, sp. nov., *S. aceris*, sp. nov., *S. ulmicola*, *S. yanonis*, *S. yanonis aesculi* subsp. nov., *S. quercus japonica* subsp. nov. on *Quercus acutissima*, and *S. quercus pini* on *Pinus densiflora*.

3331. SCHUDER, D. L. ***Lecanium* scale insects and their control.** *Trees Mag., Ohio* 21 (1), 1960 (10-2, 18). 13 refs.

Reviews, with literature references and some research data, the results of several insecticidal treatments to control a number of *Lecanium* spp. Experiments indicate that the new insecticides, Ethion and Sevin, may be recommended for the control of scale insects on species sensitive to malathion.

3332. KNEITZ, G. **Der grosse Buntspecht (*Dendrocopos major* L.) als Vertilger der Eichen-napfschildlaus (*Eulecanium rufulum* Ckll., Homoptera, Coccoidea).** [***D. major* as a predator of *E.***

rufulum.] *Waldhygiene* 3 (8), 1960 (240-5). 16 refs. [G.]

Describes observations on Oak heavily infested with *E. rufulum*. Woodpeckers were observed feeding the coccids to their young in large quantities. However, a count of the light patches visible where a coccid had been picked off indicated that, within a radius of 15 m. from the nest, the number destroyed varied between 0 and 18%, the mean not exceeding 10%.

3333. WATSON, W. Y., UNDERWOOD, G. R., and REID, J. **Notes on *Matsucoccus macrocitrices* Richards (Homoptera: Margarodidae) and its association with *Septobasidium pinicola* Snell in eastern Canada.** Repr. from *Canad. Ent.* 92 (9), 1960 (662-7). 6 refs.

Presents notes on biology, distribution and insect/fungus relationships of these species, which are found in central Ontario and the Maritime Provinces on White Pine. The insect appears to have a 2-year life cycle and its relationship with the fungus is probably symbiotic. Damage to the host tree is negligible.

3334. WILLAN, R. G. M. **A note on the apparently successful control of the white aphid (*Orthezia insignis* Dougl.) by the coccinellid *Hyperaspis jocosus*.** *Nyasald. Fmr. For.* 5 (3), 1961 (2-3). 2 refs.

Describes the importation of these ladybirds to control an infestation of ornamental trees at Blantyre. [Cf. Kenya, F.A. 10 p. 147.]

Lepidoptera

See also Nos. 2943, 3118, 3219, 3306, 3308, 3312-4, 3316, 3828.

3335. ŻUKOWSKI, R. **Obserwacje nad pojawem i ewentualnym przebiegiem gradacji u niektórych gatunków motyli w latach 1949-1959 na obszarze Pienińskiego Parku Narodowego.** [Observations on the occurrence and outbreaks of some species of Lepidoptera in the Pieniny National Park, 1949-59.] *Sylvan* 104 (10), 1960 (37-52). 11 refs. [Pol.russ.e.]

In all, 77 species (15 families) were observed, and outbreaks occurred in 25 of them. Most outbreaks were caused primarily by weather conditions, and were of only local significance, having no relation to the situation in the rest of the country.

3336. RICHTER, D. **Über Nadelmassen der Kiefer und kritische Zahlen von Schadinsekten.** [The quantity of foliage in Pine in relation to critical pest densities.] *Arch. Forstw.* 9 (10), 1960 (859-900). 68 refs. [G.g.russ.e.]

After an appraisal of (mainly German) estimates of critical densities, based empirically on degrees of defoliation, preliminary critical densities for *Panolis flammea* (pupae or eggs), *Bupalus piniarius* (ditto), *Dendrolimus pini* (larvae) and *Lymantria monacha* (♀s and eggs) are computed by relating needle consumption per larva with foliage available in stands of various ages and yield classes. Statistical analysis of data from 210 trees [see F.A. 13 No. 157] revealed a close linear relationship between weight of foliage and the quotient of b.a./height.

3337. NANOSOVA, L. I. *Biologija drevotočca pazučego*. [The biology of *Cossus cossus*.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (215-24). 32 refs. [Russ.russ.] B.A.P.

Discusses: plants damaged in the Astrakhan, Voronezh and Stalingrad area (many fruit and forest trees); flight dates; numbers of eggs laid; larval size, feeding and development; duration of the pupal stage; and parasites.

3338. VUJIĆ, P., and JODAL, I. Suzbijanje malog topolinog staklolilca primenom metode ubrizgavanja. [Control of *Sciapteron tabaniforme* by the injection method.] *Topola, Beograd* No. 15, 1960 (21-4). [Serb.f.]

The insects, which cause serious damage to young Poplars in nurseries and plantations, can be controlled by winter injection of CCl_4 or benzine into the openings of the galls formed on the stem by the larvae. Three types of syringe suitable for the purpose are illustrated.

3339. BECKWITH, R. C. The Pine needle miner on Cape Cod. *Sci. Tree Topics* 2 (8), 1961 (12-4, 10).

Data on the distribution of *Exoteleia pinifoliella*, which appears to be increasing on *Pinus rigida* in the Cape Cod area of Massachusetts.

3340. ANDROIĆ, M. *Argyresthia fundella* F.R. (Tineidae)—moljac jelinih iglica—uzročnik sušenja jele u Gorskom Kotaru. [A. *fundella*—a pest of *Abies alba* needles—the cause of dieback of *A. alba* in Gorski Kotar.] *Sum. List* 84 (7/8), 1960 (203-15). 10 refs. [Croat.croat.e.]

Once considered insignificant in Croatia, *A. fundella* built up a large population in the Fužine district from 1950 to 1957, affecting ca. 1000 ha. of *A. alba* and intensively attacking 400 ha., with resultant dieback or loss of increment. Some 12,000 cu. m. of timber were removed in salvage fellings. Attacked trees bear no seed, and the risk of deforestation on soils over calcareous rock may be serious. *A. fundella* was not found above 1000 m. alt. In field and laboratory experiments, parathion at 0.1-0.2% and Metasystox at 0.3% gave effective control of larvae. Adults can be controlled by applying a DDT preparation (Pantakan M-15) with Swingfog apparatus immediately after the emergence of the first moth, repeating the treatment after 10 and 20 days. The serious damage caused by the pest justifies the expense of control.

3341. CONNOLA, D. P. Control of Maple leaf cutter, *Paraclemensia acerifoliella*, by aerial spraying. *J. econ. Ent.* 53 (5), 1960 (957-8). 1 ref.

By spraying in July, 1959, with 9% by weight DDT in No. 2 fuel oil at 2 gal./acre, 700 acres of *Acer saccharum* orchard were successfully protected from this insect, treated at its transition stage from leaf-miner to case-bearing leaf-epidermis eater. Technical data on the operation are given.

3342. HEDLIN, A. F. Diapause in the Douglas-Fir cone moth, *Barbara colfaxiana* (Kft.). *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (4).

Examination of cocoons from the 1959 cone crop in Aug. 1960 showed that 63% of the pupae were living, 25% were dead, and 12% had emerged. Thus, under natural conditions, 63% of the cone-moth pupae remained in diapause in 1960.

3343. MARTIN, J. L. Life history of the Pine tip moth *Rhyacionia adana* Heinrich, in Ontario (Lepidoptera: Olethreutidae). *Repr. from Canad. Ent.* 92 (10), 1960 (724-8). 2 refs.

3344. BÉRIQUE, R. La tordeuse européenne des pousses du pin à Québec. [Rhyacionia buoliana in Quebec.] *Abstr. in Ann. ACFAS* 25, 1959 (90). [F.] L.S.

Natural control factors operating against *R. buoliana* have been observed in Quebec over 4 years. Cold, the most important factor, causes the death of 80-95% of larvae hibernating in buds not protected by snow. A less important factor is the larval parasites (9 species), only one of which, *Orgilus obscurator*, is really effective—causing 90% of the total parasitization.

3345. HARRIS, P. Natural mortality of the Pine shoot moth, *Rhyacionia buoliana* (Schiff.) (Lepidoptera: Olethreutidae), in England. *Canad. J. Zool.* 38 (4), 1960 (755-68). 6 refs. O.R.S.

A population of *R. buoliana* infesting a 5-year-old Scots Pine plantation on Bagshot Heath, Berkshire, was followed through 3 generations. The most important causes of mortality in the population were: an egg parasite, probably *Trichogramma evanescens*; the failure of the third-instar larvae to establish themselves in the buds; two external larval parasites, *Scambus sagax* (autumn) and *Exeristes ruficollis*; three internal parasites, *Orgilus obscurator*, *Temelucha interruptor*, and *Eulimneria rufifemur*, attacking the larvae in the autumn, but killing them in the spring after the trees were damaged; a fungus, *Paecilomyces farinosus*, that usually killed the larvae in the autumn. The total % of the population killed by parasites and fungi was usually constant from one year to the next, though the abundance of *T. interruptor* increased. Most of the annual fluctuation in abundance of the moth was caused by the differential survival of the third-instar larvae, which develop too late (Sept.) after cool summers.

3346. HARRIS, P. Number of *Rhyacionia buoliana* (Schiff.) per Pine shoot as a population index, with a rapid determination method of this index at low population levels. *Canad. J. Zool.* 38 (3), 1960 (475-8). 7 refs. O.R.S.

Describes a method of determining this index rapidly for the conspicuous third-instar larvae and older stages, by counting the number of individuals present on a tree and estimating the number of shoots by measuring the stem diameter 2 in. above ground level and referring to a predetermined shoot/diameter curve for the stand. This saves counting uninfested shoots, at low population levels.

3347. HEIKKENEN, H. J., and MILLER, W. E. European Pine shoot moth damage as related to Red Pine growth. *Sta. Pap. Lake St. For. Exp. Sta.* No. 83, 1960. pp. 12. 12 refs.

A 3-year study in 8 *Pinus resinosa* plantations in Michigan and N. Ohio, 8–17 years after planting, showed that plantations may harbour *Rhyacionia buoliana* throughout their early years without suffering serious damage, recovering later and resuming normal growth. Reduced susceptibility to moth damage was associated with rapid height growth. *P. resinosa* with a growth rate of ≥ 15 in./year before and after establishment is not seriously damaged; trees that grow < 15 in./year before establishment but > 15 in. after, tend to recover from attacks. Those that grow < 15 in./year both before and after establishment will be perennially susceptible to *R. buoliana* damage. Where *P. resinosa* will grow > 15 in./year, it is not necessary to recommend planting the less susceptible Pines. [Cf. *F.A.* 21 No. 3448.]

3348. BOIVIN, J.-L. Notes sur la biologie de la tordeuse du chêne (*Argyrotoxa semipurpurana* Kearf.). [Notes on the biology of *A. semipurpurana*.] *Abstr. in Ann. ACFAS* 24, 1958 (101–2). [F.] L.S.

Presents data on the life history of *A. semipurpurana*, which has caused extensive defoliation of Red Oak in the Quebec district.

3349. SILVER, G. T. Notes on a Spruce budworm infestation in British Columbia. *For. Chron.* 36 (4), 1960 (362–74). 6 refs.

An outbreak of *Cacoecia fumiferana* on Douglas Fir, which lasted 6 years before collapsing, is described. Population trends and seasonal development, effect of defoliation on the host trees, and parasites of the insect are discussed. *From author's abstract.*

3350. BASKERVILLE, G. L. Mortality in immature Balsam Fir following severe budworm defoliation. *For. Chron.* 36 (4), 1960 (342–5).

A study is being made of a 40- to 50-year-old stand that was defoliated annually from 1950 to 1957 (20–98% defoliation). Between 1956 and 1959, mortality was 52%. The number of dominants was reduced by 30 and of co-dominants by 40%. Surviving trees are severely weakened and with numerous potential infection courts for fungi.

3351. COPPEL, H. C., HOUSE, H. L., and MAW, M. G. Studies on dipterous parasites of the Spruce budworm, *Choristoneura fumiferana* (Clem.) (Lepidoptera: Tortricidae). VII. *Agria affinis* (Fall.) (Diptera: Sarcophagidae). *Canad. J. Zool.* 37 (6), 1959 (817–30). 26 refs. O.R.S.

Describes the life history, biology, laboratory rearing, and immature stages of *A. affinis*, one of the commoner native sarcophagid parasites of *C. fumiferana* in British Columbia.

3352. BIRD, F. T. Polyhedrosis and granulosis viruses causing single and double infections in the Spruce budworm, *Choristoneura fumiferana* Clemens. *Journal of Insect Pathology*, New York 1 (4), 1959 (406–30). 23 refs. O.R.S.

3353. THOMSON, H. M. A microsporidian infection in the Jack-Pine budworm, *Choristoneura*

pinus Free. *Canad. J. Zool.* 37 (2), 1959 (117–20). 4 refs. O.R.S.

Describes a microsporidian parasite in *C. pinus* very similar to *Perezia fumiferanae*, which attacks the Spruce budworm, *C. fumiferana*. The differences between the two microsporidians are not considered great enough to justify the creation of a new species.

3354. GÜNTHER, S. Eine Mikrosporidie aus dem grünen Eichenwickler (*Tortrix viridana*). [A microsporidian of *T. viridana*.] *Z. angew. Ent.* 46 (2), 1960 (209–12). 7 refs. [G.g.e.] O.H.

Describes *Thelohania weiseri*, sp. nov., found in the fat-bodies of *T. viridana* larvae from Thuringia and Saxony, together with two unknown flagellates and most of the known micro-parasites of the species.

3355. OSSOWSKI, L. L. J. A virus disease in the biological control of the Wattle bagworm. *Report, 7th Commonwealth Entomological Conference, London* 1960 (118–22). 8 refs.

A review of the damage caused by *Kotochalia junodi*, its control by chemical means, and experiments since 1955 on the possibility of control by an artificial increase in the concentration of virus, and of initiation of epizootics. [Cf. *F.A.* 21 Nos. 4661–2.]

3356. BOLDARUEV, V. O. Sibirskij šelkoprvjad (*Dendrolimus sibiricus* TSHTV.) i ego parazity v pihtovyh lesah Krasnojarskogo kraja. [*D. sibiricus* and its parasites in the Fir forests of the Krasnojarsk region [W. Siberia].] *Zoologičeskij Žurnal, Moskva* 38 (7), 1959 (1042–8). 5 refs. [Russ.e.] I.I.E.

[Cf. *F.A.* 18 No. 1877.] Discusses, with tabulated data showing various host/parasite relationships etc., the rôle of parasites (mainly *Telenomus gracilis* and *Rhogas dendrolimi*) in arresting the outbreak of *D. sibiricus* on *Abies sibirica* in 1956–57. The value of the biological control thus obtained is stressed, particularly since the occurrence of overlapping generations of *D. sibiricus* made chemical control difficult. The control effected by jackdaws (*Coloeus monedula*), particularly near villages, is also mentioned.

3357. GUKASJAN, A. B. “Moločnaja” bolezn' gusenice sibirskogo šelkoprvjada. [The “milky” disease of *Dendrolimus sibiricus* larvae.] *Izv. Akad. Nauk SSSR (Ser. biol.)* 1960 (2), (291–3). 3 refs. [Russ.russ.e.] A.P.B.

Describes this new disease, which causes considerable mortality among the older instars of *D. sibiricus* larvae in the taiga forests of Siberia. The symptoms of the disease are detailed. Laboratory and field trials with a strain of the pathogen (close to the genus *Bacillus*) obtained from the milky haemolymph of diseased larvae indicate that the disease could be a potent means of biological control.

3358. THOMSON, H. M. A microsporidian parasite of the forest tent caterpillar, *Malacosoma disstria* Hbn. *Canad. J. Zool.* 37 (3), 1959 (217–21). 7 refs. O.R.S.

Describes a new species of microsporidian for

which the name *Perezia disstriae* is proposed. It attacks primarily the silk glands and the mid-gut, but other tissues are also infected.

3359. ŠAPIRO, V. A. Rol' parazitov v sniženii čislennosti kol'čatogo šelkopriada. [The role of parasites in reducing the numbers of *Malacosoma neustria*.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (71-86). 22 refs. [Russ.] B.A.P.

Nine parasites (1 of the eggs, 6 of the larvae, and 2 of the pupae) were found attacking *M. neustria* in the Voronezh region; 90 parasites are also listed from the literature. The parasites found had little effect on *M. neustria* populations individually, but collectively they exerted a considerable measure of control. If chemical control becomes necessary, it is best carried out in early spring against the first-instar larvae; this spares most of the parasites. Silvicultural measures (mixed, multi-storeyed stands, high stand density, provision of shrubby margins and undergrowth) can also assist in controlling *M. neustria*.

3360. MALYŠEVA, M. S. Vlijanie aviaopylivaniya na čislennost' osnovnoj pjadenicy i ee parazitov. [Effect of aerial dusting on the numbers of *Bupalus piniarius* and its parasites.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (41-56). 14 refs. [Russ.russ.] B.A.P.

In order to control an outbreak of *B. piniarius* in 1954-56 in the Voronezh region, some 900 ha. of Scots Pine were dusted in late July with 5-5% DDT dust at 24 kg./ha. from an aeroplane. Most of the larvae were then in the second instar. Resistance to the treatment increased with decreasing larval population density; in heavily attacked areas, kills of 100% were achieved vs. 70% in one lightly attacked area. Though the number of predators and parasites was sharply reduced by the dusting, the survivors were sufficient to cause almost as much damage (proportionally) as before to the surviving *B. piniarius*. Dusting should be aimed at the first- and second-instar larvae.

3361. WYLIE, H. C. Insect parasites of the winter moth, *Operophtera brumata* (Lepidoptera: Geometridae) in Western Europe. *Entomophaga* 5 (2), 1960 (111-29). 50 refs. [E.g.] O.H.

Lists 63 (confirmed and doubtful) parasites, including 26 reared in the present investigations, 11 of which are new for this host, and presents notes on distribution and life history of species reared. From author's summary.

3362. EMBREE, D. G. Observations on the spread of *Cyzenis albicans* (Fall.) (Tachinidae: Diptera), an introduced parasite of the winter moth, *Operophtera brumata* (L.), (Geometridae: Lepidoptera), in Nova Scotia. *Repr. from Canad. Ent.* 92 (11), 1960 (862-4). 3 refs.

C. albicans has been released at intervals in Nova Scotia since 1954, and data collected in 1957-59 in connexion with population studies of *O. brumata* at Debert, Nova Scotia are presented and discussed. So far, % parasitization in any particular area is

more dependent on distance of the area from the liberation site than on host density.

3363. KANEKO, T. [Egg-laying of *Oligia [Procus] vulgaris* and its control.] *J. Jap. For. Soc.* 41 (4), 1959 (148-9). 9 refs. [Jap.]

The author's observations, over 5-6 years, of the egg-laying habits of *O. vulgaris* on *Phyllostachys reticulata*, *P. nigra* and *P. edulis* in Aichi Prefecture (where sometimes >50% of the culms of the first two species are attacked), lead him to conclude that hand-picking of the eggs is an effective method of control.

3364. DISSESCU, G. Folosirea, in lucrările de prognoză, a depunerilor de ouă ale insectei *Euproctis chrysorrhoea* L. [The use of egg masses in forecasting outbreaks of *E. chrysorrhoea*.] *Rev. Pădurilor* 75 (7), 1960 (432-5). 6 refs. [Rum.russ. g.e.f.]

Develops methods of determining the sampling intensity necessary and a formula relating number of eggs to weight of egg mass ($Y = X/0.000181$, where Y = mean number of eggs in a mass, and X = mean weight of egg mass in grams).

3365. VUNČ, P. O pojavi topolinog gubara (*Stilpnotia salicis* L.). [An occurrence of *S. salicis*.] *Topola, Beograd* No. 16, 1960 (20-2). 3 refs. [Serb.f.]

In 1960, *Populus × canadensis* trees in Vojvodina were completely defoliated by *S. salicis*. In Yugoslavia, the pest has two generations a year, thus attacking the Poplars twice. It hibernates in larval form, and is most readily controlled in the spring when emerging from the diapause, before it can attack the young leaves and form a second generation. A systemic rather than a contact insecticide is advised, to avoid the destruction of natural enemies.

3366. NIKOLIĆ, S. Geometriske sheme o nekim biološkim procesima. [Geometrical schemes of some biological processes.] *Šumarstvo* 13 (5/6), 1960 (283-94). 15 refs. [Serb.f.]

Discusses the representation of life processes in mathematical form and by means of generalized geometrical figures. The life of *Lymantria monacha*, studied by the author in the Goč mountains and at Čačak, Serbia, is used as an example.

3367. JANKOVIĆ, L. Biljke hraniteljke gubara (*Lymantria dispar* L.) u prirodi u toku jedne gradacije. [Gypsy moth (*L. dispar*) host plants during the course of a single outbreak.] *Zborn. Rad. Biol. Inst. N.R. Srbije* 2 (2), 1958 (1960). pp. 15. 18 refs. [Serbe.]

At low population levels, *L. dispar* feeds primarily on trees, particularly *Quercus* spp., but when the population erupts will eat plants of many kinds. A list of 208 known food plants in Yugoslavia is given, including 60 species of forest tree (54 broad-leaved and 6 coniferous). The outbreak of 1953-57 is discussed [cf. *F.A.A.* No. 741].

3368. LIKVENTOV, A. V. O sderživajuščem vlijanii dubovo-lipovyh drevostoev na razmnoženie neparnogo šelkopriada. [The deterrent effect of

Oak/Lime mixtures on the multiplication of *Lymantria dispar*. *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (33-40). 19 refs. [Russ.] B.A.P.

A diet of Lime leaves alone, of Lime then Oak, of Oak then Lime, and alternating Lime and Oak, fed to *L. dispar* larvae, significantly increased mortality, prolonged the period of development, and reduced the % of ♀s, the mean pupal weight, and fertility (number of eggs laid), by comparison with larvae fed on Oak foliage alone. Studies at 8 sites in the N. Ossetian ASSR, and the Tula, Voronezh, Krasnodar and Belgorod regions from 1949 to 1956 confirmed these findings, and it is concluded that the inclusion of 20% Lime in Oak stands and shelterbelts should materially assist in preventing outbreaks of *L. dispar*, and possibly of other insect pests too.

3369. HOLBROOK, R. F., BEROZA, M., and BURGESS, E. D. Gypsy moth (*Porthetria dispar*) detection with the natural female sex lure. *J. econ. Ent.* 53 (5), 1960 (751-6). 7 refs.

Illustrates the modified Graham and other traps, and reports on trials of trap colour, bait dispensers, adhesives, effective life and strength of bait and its collection, and trap siting (height, wind direction, density of setting, replication, season etc.) for surveys.

3370. HUDDLESTONE, E. W., GYRISCO, G. G., and LISK, D. J. DDT residues on New York dairy farms following the gypsy moth eradication program. *J. econ. Ent.* 53 (6), 1960 (1019-21). 2 refs.

A widespread contamination of milk, lasting one year, and of hens' eggs for one month, following aerial spraying against *Lymantria dispar* is referred to the persistence on forage of the DDT/oil solutions. It is concluded that DDT should not be used in dairy-farm areas, as it cannot be so used without contaminating the milk supply.

3371. KALIDIS, D. S. Katapolemēsis tēs knētho-kampēs tēs peukēs. [Control of *Thaumetopoea pityocampa*?] on Pine.] *Das. Chron.* 2 (24), 1960 (1049-53). 7 refs. [Gk.e.]

Experience in Greece has shown that the former method of combating this pest, viz. by applying BHC (as liquid or powder) to the larval nests, is ineffective, because up to the third instar, the larvae keep moving to other nests. The life cycle also shows a different rhythm according to altitude. Several egg and larval parasites have been found [unspecified] and also several diseases, including viruses with distinctive symptoms (described). In 1960, larvae were practically wiped out over a large area of Thessalonica. Healthy larvae there, exposed to filtered aqueous extracts of sick and dead larvae, were not affected, whereas those from S. Greece died.

3372. GRISON, P. Utilisation en forêt d'une préparation à base de virus spécifique contre *Thaumetopoea pityocampa* Schiff. [Control of *T. pityocampa* in the forest with a specific virus preparation.] *Z. angew. Ent.* 47 (1), 1960 (24-31). 16 refs. [F.g.g.] O.H.

A slightly later account of an operation on Mt. Ventoux [cf. F.A. 20 No. 4901 and 21 No. 749]. Though only ca. 10% of pupating larvae were free from virosis, the number of emerging adults, though small, was not negligible. A further treatment took place in September 1959.

Coleoptera

See also Nos. 2724-5, 2729, 2774, 3092, 3257, 3298, 3306, 3311, 3316, 3318.

3373. LEKIĆ, M. Način života i mogućnosti suzbijanja vrbinog prstenara. [Life history and possibility of control of *Agrilus acutangulus*.] *Topola, Beograd* No. 15, 1960 (24-8). [Serb.f.]

A. acutangulus has recently become a serious pest of osiers in Macedonia. Data on its biology and ecology are given. Silvicultural control measures are suggested. Chemical control is economic only when very high populations are present. Formulations based on γBHC, P, and DDT have proved effective against adults.

3374. SCHEDL, K. E. *Agrilus*-Schäden an Erle in Kärnten. [Injuries by *Agrilus* on Alder in Carinthia.] *Allg. Forstztg.* 71 (23/24), 1960: *Suppl. (Informationsdienst* No. 39). pp. 2. [G.]

Describes an outbreak of *Agrilus viridis* on *Alnus incana* stands in the Drau flood-plain, after severe snow damage. Spraying infested stems with the systemics Phosdrin (0.1-0.2%) and Forstviton (0.4%) failed to kill the larvae.

3375. HINCKLEY, A. D. Mortality of two beetles, *Araecerus levipennis* Jordan and *Mimosstes sallaei* (Sharp), in field populations. *Abstr. of thesis, in Dissert. Abstr.* 21 (5), 1960 (1298-9). O.R.S.

In pods of *Leucaena glauca* and *Acacia farnesiana*. Factors discussed as affecting mortality include age of pod, hardness or mouldiness of seed, and parasites.

3376. HALPERIN, J. The occurrence of the Elm leaf beetle in Israel. *La-Yaaran* 10 (1/4), 1960 (35-9, 52-51). 2 refs. [Heb.e.]

Covers the biology and control of *Galerucella luteola* infesting native and introduced Elms in Palestine. Five generations occur between April and October, each of 30-53 days, i.e. oviposition 4-8; eggs 7-8; larvae 14-25; pupae 5-10 days. Dusting of the litter and ground in mid-May and June is recommended as a control measure.

3377. ROSS, D. A. Damage by long-horned wood borers in fire-killed Spruce, central British Columbia. *For. Chron.* 36 (4), 1960 (355-61). 1 ref.

The amount of damage caused by *Monochamus oregonensis* was determined in sample trees of 3 bark-burn categories of fire-killed *Picea glauca* at each of 4 localities. The 4 fires occurred at different times in the summer. The severe bark-burn class contained the lightest beetle populations; the moderate burn class had the heaviest. The lightest population was in the timber burned latest in the season. *From author's abstract.*

3378. DOMINIK, J. O podziemnych wędrówkach larw dyląza gabarza. [The underground travels of *Prionus coriarius* larvae.] *Sylwan* 104 (9), 1960 (49-51). 5 refs. [Pol.russ.e.]

Brief observations on the habits of the older larvae, which may damage the surface of tree roots.

3379. PETROVA, I. A. Rol' *Saperda carcharias* L. v ushianii topolevnikov Savalskogo lesnichestva i puti uluchsheniya sostojaniya nasazhdenij. [The role of *S. carcharias* in the dying of Poplar stands in the Savala forest district, and ways of improving stand condition.] *Trudy Vsesojuznogo Instituta Zashchity Rastenij, Leningrad* No. 14, 1960 (31-42). 23 refs. [Russ.] B.A.P.

Measures to control *S. carcharias*, a stem pest of 'Canadian' and Black Poplars, include: introducing soil-shading plants (*Corylus avellana*, *Viburnum opulus*, *Physocarpus opulifolia*, *Rhus cotinus*, *Acer tataricum*) into pure Poplar stands, and also *A. platanoides*, *A. campestre*, *Tilia* spp., and *Ulmus laevis* where the Poplar is widely spaced; felling trees with dead tops and crowns; clear felling with root grubbing of heavily infested young stands; and conversion to mixtures with the shrubs and trees indicated above.

3380. RUNGE, G. F., JR. *Taxus* weevil threatens Yews and Rhododendrons. *Amer. Nurseryman* 112 (12), 1960 (15, 84-5).

Discusses the damage (mainly by larvae to plant roots) caused by *Brachyrhinus sulcatus*, its life history, and control by spraying or soil treatment.

3381. SZALAY-MARZSÓ, L. Adatok a tarka füzorományos (*Cryptorhynchus lapathi* L.) magyarországi életmódjához és az ellene végzett védekezési kísérletek. [The biology and life cycle of *C. lapathi* in Hungary and experiments on its control.] *Erdő* 8 (8), 1959 (314-20 + smries. in suppl.). 7 refs. [Hu.russ.g.]

Details of the biology and life cycle of *C. lapathi* and its effects on (mainly) Willow and Poplar in Hungary. Chemical control measures are discussed, and details given of tests with various commercial insecticides (Novenda, Duotox, Agritox, Wofatox, Metasystox and Oleoparathion), all of which gave inconclusive or no results, even at increased concentrations. Successful control of larvae was effected by burning damaged material or felling trees at ground level.

3382. MALYSHEVA, M. S. K biologii ploskonosogo dubovogo slonika—*Gasterocercus depressirostris*, F. (Coleoptera, Curculionidae). [The biology of *G. depressirostris*.] *Trudy Vsesojuznogo Instituta Zashchity Rastenij, Leningrad* No. 15, 1960 (205-8). 3 refs. [Russ.] B.A.P.

G. depressirostris, the larvae of which develop in the wood of Oak stems, is a serious pest in places in the Voronezh region. Ecological investigations have shown that it prefers the more open, sunny stands. Some data on its life cycle are also given.

3383. ÉDEL'MAN, N. M. Nekotoryye dannye po biologii dubovogo ploskonosogo dolgonosika *Gasterocercus depressirostris*, F. [Some data on the

biology of *G. depressirostris*.] *Trudy Vsesojuznogo Instituta Zashchity Rastenij, Leningrad* No. 15, 1960 (209-14). 2 refs. [Russ.] B.A.P.

[See preceding abstr.] Tabulates data, gathered during studies in the Voronezh region in Oak plantations 50-60 years old with no shrubs or underwood, on the food preferences, mortality, and physiological condition produced by different kinds of food, in adults of *G. depressirostris*.

3384. THATCHER, R. C. Influence of pitch eating weevil on Pine regeneration in East Texas. *For. Sci.* 6 (4), 1960 (354-61). 4 refs.

Covers the life history, habits and control of *Pachylobius picivorus*, which is, despite former opinion, locally more important than the pales weevil, since it contributes 85% to the weevil population and an even higher % to the damage done. Conclusions are that Pine can safely be planted on areas felled earlier than the previous July. If planted within 6 months of felling, seedlings should be dipped in preparations of aldrin, heptachlor, or (top dipped, not roots) BHC. One or 2 years' delay in felling may save advance reproduction (very susceptible up to 2 years), and regeneration from fellings in seed-years is unlikely to suffer excessive losses.

3385. ANDERSON, J. M., and FISHER, K. C. The response of the White Pine weevil to naturally occurring repellents. *Canad. J. Zool.* 38 (3), 1960 (547-64). 12 refs. O.R.S.

The reactions of *Pissodes strobi* to air-borne repellents were studied in an olfactometer (described, with diagram) that permitted a quantitative measure to be made of an individual's response. Using essential oils, distilled from the bark of *Picea glauca*, *P. mariana*, *P. rubens*, *P. abies*, *P. obovata*, *P. asperata*, and *Pinus strobus*, as the odorous material, it was found that degree of oil repellency and tree species were related, that the response of any one individual tended to be consistent and that ♂ and ♀ responses were the same. The curve relating the concentration of the repellent to the response was similar to those generally describing the relationship between stimulus strength and response. Adaptation to the repellent odours was clearly seen. From analysis of a motion-picture film it was apparent that repellent vapours affected weevil behaviour so that the duration of activity periods was shortened, although the rest periods remained constant. [Cf. F.A. 17 No. 87.]

3386. COURTOIS, J.-É., CHARARAS, C., and CHARITUS, N. Recherches sur les possibilités d'attaque de *Pseudotsuga douglasii* par *Ips typographus* L. (Coléoptère Scolytidae). [Studies on the possibilities of attack by *I. typographus* on *P. taxifolia*.] *C.R. Acad. Sci., Paris* 251 (5), 1960 (797-9). 6 refs. [F.f.] O.R.S.

Although Douglas Fir is rarely attacked by *I. typographus* in France, attack could be induced in experiments on trees with reduced osmotic pressure, containing only small amounts of reducing sugars. Glucose, fructose, saccharose, raffinose and stachyose were isolated from bark of healthy trees.

3387. CHARARAS, C. Variations de la pression osmotique de *Picea excelsa* à la suite des attaques de *Dendroctonus micans* Kug. (Coléopt. Scolytidae). [Variations in osmotic pressure of *P. abies* following attack by *D. micans*.] C.R. Acad. Sci., Paris 251 (18), 1960 (1917-9). [F.f.] O.R.S.

The insect was found on 386 individuals, 342 of which had been damaged by wind or during felling of neighbouring trees. In the region of attack, osmotic pressure dropped to a level of 4.2 atm. after 48 days. Among the trees attacked were undamaged ones with osmotic pressures of 7.5-9.5 atm.

3388. KOWAL, R. J. Southern Pine beetle [*Dendroctonus frontalis*]. For. Pest Leaflet. U.S. For. Serv. No. 49, 1960. pp. 6.

Covers distribution, hosts, symptoms, description, life history, habits and control (by salvage felling, BHC sprays, etc.).

3389. LYON, R. L., and WICKMAN, B. E. Mortality of the Western Pine beetle [*Dendroctonus brevicornis*] and California five-spined ips [*Ips confusus*] in a field trial of lindane. Res. Note Pacif. Sthwest. For. Range Exp. Sta. No. 166, 1960. pp. 7. 1 ref.

The stems of Ponderosa Pine infested with (a) *D. brevicornis* and (b) *I. confusus* were treated with 1.5% lindane/diesel-oil spray in March in California. Samples of sprayed and unsprayed material were taken to the laboratory to study the survival of emerging beetles. Mortality on emergence, due to the spray, was 92% for (a) and 100% for (b).

3390. KNIGHT, F. B. Sequential sampling of Engelmann Spruce beetle infestations in standing trees. Res. Note Rocky Mt. For. Range Exp. Sta. No. 47, 1960. pp. 4. 3 refs.

Presents two plans for sampling—one in June of the year following attack by *Dendroctonus engelmanni* when the progeny are in the larval stage, and the other in Aug. or Sept. of the same year, when they are young adults. [Cf. F.A. 16 No. 4287; 21 No. 4692.]

3391. KNIGHT, F. B. Sequential sampling of Black Hills beetle populations. Res. Note Rocky Mt. For. Range Exp. Sta. No. 48, 1960. pp. 8. 6 refs.

A procedure for sampling *Dendroctonus ponderosae* infestations for predicting trends, using a fixed sample size, has been developed [see F.A. 21 No. 767]. The present note applies sequential sampling, instead of a fixed sample [cf. F.A. 16 No. 4287].

3392. SHEPHERD, R. F. Distribution of the Black Hills beetle over the host tree and factors controlling the attraction and behaviour of the adult. Abstr. of thesis, in Dissert. Abstr. 21 (4), 1960 (1001). O.R.S.

Distribution of *Dendroctonus ponderosae* was studied by felling 60 trees of *Pinus contorta* var. *latifolia*, dividing the bark surface into quadrats, 1 sq. ft. in area, and tallying for each quadrat the compass direction, tree diam., height, bark roughness according to 3 arbitrary classes, number of branches, and after removal of bark, the number of galleries. Attack was heaviest at the bottom of the tree, and on the N. side, followed in order by E.,

W. and S. Branches have little effect on distribution, but the presence of medium to extremely rough bark appears to be necessary for attack. In laboratory studies, beetles were attracted to higher light intensities on emergence, but not when making their galleries. They appear to avoid extremes of temperature and to prefer low humidities. Light and high temperatures stimulate flight. Logs of different physical characteristics were exposed to attack in areas where broods were present in standing trees. Difference in diameter appeared to have no effect on attack when the factor of bark roughness was eliminated. When logs of equal physical attractiveness were exposed at different heights the uppermost log was most heavily attacked. In cage tests, pieces of bark with the highest moisture content were preferred. Beetles are attracted to trees (a) undergoing attack or (b) having suffered similar mechanical injury. If the beetles are drowned out with resin, the attraction of (a) and (b) is about the same, but if they have established galleries successfully, (a) are much more attractive than (b).

3393. CAHILL, D. B. The relationship of diameter to height of attack in Lodgepole Pine infested by mountain Pine beetle [*Dendroctonus monticolae*]. Res. Note Intermt. For. Range Exp. Sta. No. 78, 1960. pp. 4.

Measurements were made of 749 infested trees and the results analysed. A definite correlation was found between d.b.h. and the height of mountain-beetle attack in this Pine. Taking the height to which hand spraying can be done (ca. 27.5 ft.) as a datum line, it was found that only 6% of infested trees in the 8-9 in. diam. class but ca. 66% of trees of ≥ 14 in. d.b.h. were infested above the line.

3394. RUDINSKY, J. A., TERRIERE, L. C., and ALLEN, D. G. Effectiveness of various formulations of five insecticides on insects infesting Douglas Fir logs. J. econ. Ent. 53 (5), 1960 (949-53). 14 refs.

Spraying with endrin, lindane, Thiodan (6, 7, 8, 9, 10, 10-hexachloro-1, 5, 5a, 6, 9, 9a-hexahydro-6, 9-methano-2, 4, 3-benzodioxathiepin-3-oxide), Sevin (1-naphthyl methylcarbamate) and heptachlor in (a) solution, (b) suspension, (c) emulsion, on the bark of freshly cut logs, gave very good protection from *Dendroctonus pseudotsugae* and other bark and wood borers. Both (c) and (a) proved more effective than (b), a finding supported by bioassay and bark analyses at 10 weeks to test bark penetration.

3395. ROBERTS, H. *Trachyostus ghanaensis* Schedl (Col., Platypodidae), an ambrosia beetle attacking Wawa, *Triplochiton scleroxylon* K. Schum. Tech. Bull. W. Afr. Timb. Borer Res. Unit No. 3, 1960. pp. 17 + 5 plates. 4 refs.

A detailed illustrated account of a serious pest penetrating to the heartwood of living trees (unique in the ambrosia group) and degrading much lumber below export standard. Control is by maintaining fast growth in taungya and by freeing the canopy in natural stands.

3396. HEIDENREICH, E. Weitere Beobachtungen an *Xylosandrus germanus*. [Further observations on

X. germanus.] *Anz. Schädlingsk.* 33 (12), 1960 (187-8). 2 refs. [G.g.]

Presents the results of further observations made in 1960 on an outbreak near Darmstadt [cf. *F.A.* 21 No. 3493]. These confirm that only under certain conditions of temperature and humidity can *X. germanus* constitute a primary pest of forest trees.

3397. PETRENKO, I. A. K biologij olenki (*Epicometis hirta* Poda) v lesnyh polosah Ural'skogo stacionara. [The biology of *E. hirta* in forest belts of the Ural'sk Experiment Station [W. Kazakhstan].] *Soobšč. Inst. Les.* No. 11, 1959 (71-5). 3 refs. [Russ.]

The pest attacks the buds of berry-bearing plants (especially *Ribes aureum*). Data are tabulated on the numbers of ♀s and ♂s during the flight period and during the day, beetle population density, and the effects of BHC dusting on beetle mortality.

3398. KONDO, Y. [Ecological studies of *Lachnosterna kiotoensis* Brenske in the forest nursery.] *Transactions of the Tottori Society of Agricultural Science*, Tottori 12, 1960 (142-9). 18 refs. [Jap. jap.e.e.] C.G.B.

The behaviour of *L. kiotoensis* is compared with that of other scarabeids (21 species so far collected in the Tottori University forest nursery). The period of activity of the larvae was shorter and they were active at lower temperatures (16-24° C.) than other larvae studied. They are considered less harmful in this nursery than larvae of *Anomala rufocuprea*.

3399. ŽINOJINVIĆ, D. Ekonomska opravdanost zaštite šumskih kultura od grčica na Deliblatskom Pesku hemiskim sredstvima. [Economic justification of protection of plantations against cockchafer on the Deliblato Sands by chemical means.] *Šumarstvo* 13 (9/10), 1960 (425-8). 3 refs. [Serb.f.]

The application of 'Geolin' (chemical basis not given) when planting in this area of high cockchafer infestation was found to be economic. Planting costs went up by 6.4-13%, but successful establishment by ca. 45%, giving a return of 3.5-7 times the investment.

3400. BEREZINA, V. M. Geografičeskaja zonal'nost' stacjal'nogo razmeščeniya vostočnogo majsogo hrušča na territorii SSSR. [Geographic zones of the distribution of *Melolontha hippocastani* in the U.S.S.R.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij*, Leningrad No. 15, 1960 (87-128). 142 refs. [Russ.] B.A.P.

An analysis in the zones 56-60°, 53-56°, 50-53°, and 48-50° N. in European Russia, and also in the Asiatic part of the U.S.S.R., based mainly on the literature.

3401. BEREZINA, V. M. Period aktivnogo sostojanija vostočnogo majsogo hrušča v imaginal'noj faze razvitiya. [The period of activity of *Melolontha hippocastani* in the imago stage.] *Trudy Vsesojuznogo Instituta Zaščity Rastenij*, Leningrad No. 15, 1960 (129-76). 162 refs. [Russ.] B.A.P.

A review of Soviet and European literature,

together with some data on the effects of environmental conditions on *M. hippocastani* in the Savala forest district, Voronezh region.

Hymenoptera

See also Nos. 2730, 3313-4, 3316.

3402. ZONDAG, R. Progress report on the establishment in New Zealand of *Ibalia leucospoides* Hochenw., a parasite of *Sirex noctilio* (F.). *Res. Note N.Z. For. Serv.* No. 20, 1959. pp. 10. 9 refs.

Describes the results of a rearing method adopted for propagating *I. leucospoides*, involving the use of [mainly] *Pinus radiata* logs in which *S. noctilio* oviposition had previously occurred. Despite the 2- to 3-year life cycle recorded for *Ibalia* in Europe, a one-year period is the norm in the New Zealand insectaries, with a small degree of emergence in the second year. In proportion to the numbers of ♀s used for rearing, the numbers of adults emerging from the logs are low. Liberations are made in the forest within 9 days of *Sirex* oviposition, preferably in areas where trees standing close together have been attacked. At present *I. leucospoides* is definitely established in two forests and doubtfully in a third, experiments showing it to be facultatively parthenogenetic. The main cause for its low numbers is that logs used for rearing cannot be kept in the insectaries at the optimum m.c. for the development of the host larvae, ca. 10% of the logs used in the 1956 breeding season being very dry and showing no exit holes of either host or parasite.

3403. BOUCHARD, P. La tenthrède européenne de l'aune, *Eriocampa ovata* L. [*E. ovata*.] *Abstr. in Ann. ACFAS* 25, 1959 (89). [F.] L.S.

This pest of *Alnus incana* was first found near Quebec city during 1957-58. It had previously been reported from British Columbia, but has nowhere caused extensive damage. Its distribution seems to coincide with that of its host. Notes are presented on its life history and factors limiting its spread.

3404. FORSSLUND, K.-H. Studier över lilla tallstekeln *Diprion (Microdiprion) pallipes* (Fall.). [Studies on *D. pallipes*.] *Medd. Skogsforskn.-Inst., Stockh.* 49 (8), 1960. pp. 62 + 1 plate. 41 refs. [Sw.sw.g.g.]

A monograph describing the insect and discussing its taxonomy, distribution, biology, enemies, etc. Serious outbreaks occurred in the 1950's in N. Dalarna and Lapland, mainly on clear fellings and burns, and there chiefly on Pines 5 to 150 cm. high but occasionally on older trees. Detoxyl, Witoxyl and Xylamon were successfully used for control by spraying from the ground. Aerial spraying with Gesarol had to be repeated the following year. [Cf. *F.A.* 19 No. 737.]

3405. RUMMUKAINEN, U. Kesän 1960 määntypistiäistuhot. [The ravages of Pine sawflies in the summer of 1960.] *Metsät. Aikak.* 1960 (12), (448-50). [Fie.]

Presents data on the extent of the outbreak of

Neodiprion sertifer, especially severe in S.E. Finland, on mature Pines.

3406. GRIFFITHS, K. J. Parasites of *Neodiprion pratti banksianae* Rohwer in northern Ontario. *Repr. from Canad. Ent.* 92 (9), 1960 (653-8). 6 refs.

Eleven parasites of feeding-stage larvae and 7 of cocooned larvae were collected over the years 1954-56 in two study areas. Data on the relative abundance of the parasites are presented. Considerable variation in parasitization was found, especially in the earliest and latest immature stages.

3407. GHENT, A. W. A study of the group-feeding behaviour of larvae of the Jack Pine sawfly, *Neodiprion pratti banksianae* Roh. *Behaviour, Leiden* 16 (1/2), 1960 (111-48). 14 refs. [E.e.g.] O.R.S.

The causal factors and selective mechanisms responsible for the development of the group-feeding behaviour of *N. pratti banksianae* on *Pinus banksiana* needles were studied. The main findings included: (1) Hatching orientation is constant, all larvae being directed towards the needle tip. (2) Larval aggregations were the product of a strong aggregative stimulus, forming at wide extremes of light, temperature and humidity, and evidently independent of these factors. The stimulus to aggregate remained equally strong throughout larval life. Larvae displayed no interest in each other when removed from the Pine foliage, dispersing randomly on a grid, but were remarkably responsive to the odour of Pine foliage and of the saliva of feeding insects. It was postulated that established feeding sites attract additional larvae through an olfactory response. (3) No difference in rate of development of larvae reared in groups and those reared alone was noted, but the first-instar mortality rate was substantially higher in solitary rearings. (4) Feeding aggregations were found invariably to form round a feeding site established by an individual larva; after this establishment, individual effort was abandoned by unsuccessful larvae in favour of group exploitation. (5) The survival advantage gained in the first instar by exploitation of the feeding incisions made by the few larvae that managed to cut into the tough needle cuticle and epidermis is thought to be the selective mechanism that has brought about the evolution of group feeding. *From author's summary.*

3408. O'NEIL, L. C. Croissance du pin gris *Pinus banksiana* Lamb. défolié par la mouche à scie de Swaine *Neodiprion swaini* Midd. (Hymenoptères, Diprionidés). [Growth of *P. banksiana* defoliated by *N. swaini*.] *Abstr. in Ann. ACFAS* 24, 1958 (101). [F.] L.S.

The influence of defoliation on the growth of *P. banksiana* is difficult to assess, but it has been established that trees defoliated by *N. swaini* show a marked retardation of diameter and height growth. Several years of defoliation will cause death of the leader, but death of the tree itself will follow only slowly.

3409. MARTINEAU, R. Facteurs naturels de lutte de *Diprion hercyniae* Htg. dans le Québec.

[Natural control factors of *D. hercyniae* in Quebec.] *Abstr. in Ann. ACFAS* 25, 1959 (90). [F.] L.S.

Investigations have been carried on since 1955 in Quebec to discover the effects of a virus disease and of parasites upon populations of *D. [Gilpinia] hercyniae*. Results to date indicate that the virus disease has little effect on populations. Only 2 parasite species have been obtained and total parasitization is generally <10%.

3410. MAW, M. G. Notes on the Larch sawfly, *Pristiphora erichsonii* (Htg.) (Hymenoptera: Tenthredinidae), in Great Britain. *Entomologist's Gazette, Feltham, Middlesex* 11 (1), 1960 (43-9). 19 refs. O.R.S.

After an account of the history of *P. erichsonii* in Great Britain, the encapsulation of the eggs of the parasite *Mesoleius tenthredinis* by the sawfly is discussed. This condition, known in Canada since 1940 [cf. *F.A.* 15 No. 514], was not found in Britain until 1955, when 29% of *M. tenthredinis* eggs examined were encapsulated. Though 54% of the larvae in 153 cocoons were parasitized, only 39% were killed by the parasite. *Vespa vulgaris* was noted for the first time as a predator of *P. erichsonii* larvae.

3411. BRACKEN, D. F., and MARTINEAU, R. A new outbreak of the Larch sawfly [*Pristiphora erichsonii*] in Quebec. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (1).

The present state of the outbreak is moderate to severe in western Quebec, generally light with patches of moderate or severe in central Quebec, and light or mere traces in the east. Up to now, no disease has been found in the Larch sawfly in Quebec.

3412. IVES, W. G. H. Developmental rates of Larch sawfly (*Pristiphora erichsonii* Htg.) larvae in an insectary and in field shelters. *Repr. from Canad. Ent.* 92 (9), 1960 (668-74). 1 ref.

Describes a coprometer designed to collect grass from colonies of larvae over intervals of 1 week. A comparison of rates of development of Larch sawfly in an insectary and in field shelters showed the rates to be essentially the same. The field shelters were found to approximate satisfactorily to field conditions, except on one day.

3413. TURNOCK, W. J. Estimation of adult populations of the Larch sawfly, *Pristiphora erichsonii* (Htg.). *Repr. from Canad. Ent.* 92 (9), 1960 (659-62). 5 refs.

[Cf. *F.A.* 21 No. 3506.] Describes methods and results of sampling adults as they emerge from the soil, by the use of cages covering an area of 2 sq. ft. A satisfactory degree of accuracy was obtained in a plot of 0.125 acre in a dry, pure *Larix laricina* stand with 100 cages. The use of sampling units stratified on the basis of topography was not justified except where the degree of crown closure was reduced to the point where strata based on crown cover and topography could be used. Similar stratification would probably be justified in stands containing other tree species. In a second stand, which was younger, denser, and partly flooded, the sawfly

population was very low and the ½-95% confidence interval was high in relation to the mean. As this interval was only 817 adults, the population estimate might still afford an adequate basis for the study of mortality factors. The high water table made large areas within this plot completely unsuitable for the survival of Larch sawfly. The accuracy of population estimates might be increased by more careful stratification on the basis of topography. *From author's summary.*

3414. BRONSKILL, J. F. The capsule and its relation to the embryogenesis of the ichneumonid parasitoid *Mesoleius tenthredinis* Morl. in the Larch sawfly, *Pristiphora erichsonii* (Htg.) (Hymenoptera: Tenthredinidae). *Canad. J. Zool.* 38 (4), 1960 (769-75). 28 refs. O.R.S.

Larch-sawfly larvae from Newfoundland and British Columbia were still susceptible to *M. tenthredinis* from British Columbia, but with host larvae from Manitoba, encapsulation of the parasitoid occurred when the embryo was in the late germ band stage. The capsule inhibits further embryonic development of the parasitoid, possibly by interfering with its oxygen supply. [Cf. *F.A.* 15 No. 514.] *From author's summary.*

3415. FORBES, R. S. Biology of the Mountain Ash sawfly *Pristiphora geniculata* (Htg.). *Abstr. of thesis, in Dissert. Abstr.* 21 (5), 1960 (1296-7). O.R.S.

Studies carried out at Fredericton, New Brunswick, in 1950-57 on hosts, distribution, life history, habits, development and natural control factors (chiefly rainfall).

3416. BÉRIQUE, R. Notes préliminaires sur la biologie de la mouche à scie du peuplier: *Trichiocampus viminalis* Fallén. [Preliminary notes on the biology of *T. viminalis*.] *Abstr. in Ann. ACFAS* 24, 1958 (99). [F.] L.S. [Cf. *F.A.* 21 No. 4708.]

3417. BÉRIQUE, R. Étude sur un chalcidien du genre *Trineptis* parasite de la tenthrede du peuplier, *Trichiocampus viminalis* (Fall.). [A chalcid of the genus *Trineptis*, parasite of *T. viminalis*.] *Abstr. in Ann. ACFAS* 25, 1959 (89-90). [F.] L.S.

Notes on the life history and biology of the parasite, which differs from the other 3 species of the same genus in that it does not attack Tenthredinidae of the genus *Neodiprion*. This is the first time that it has been obtained from *T. viminalis*.

3418. MARICONI, F. A. M., and CASTRO, U. PANA. Resultados preliminares do combate à saúva com alguns formicidas modernos. [Preliminary results in the control of *Atta sexdens rubropilosa* with some modern ant-poisons.] *Biológico* 26 (9), 1960 (179-83). 14 refs. [Port.] C.G.B.

Presents the results of preliminary experiments comparing the following preparations used at different dosages on anthills of *A. sexdens rubropilosa*: (1) powdered aldrin (2.5%), (2) liquid aldrin (24%), (3) chlordane (75%), and (4) MeBr (31%) + C₂H₄Br₂ (29%); (2) and (3) were diluted with water to give, for (2), 0.6% of the active principle, and for

(3), 1.5%. The treatments were given in February, and inspections made in March, April and June. Best results were obtained with (2); (4) killed no ants, though reduced activity was observed in some anthills.

3419. HÖLLDOBLER, B. Über die Ameisenfauna in Finnland-Lappland. [The ant fauna of Finnish Lapland.] *Waldhygiene* 3 (8), 1960 (229-38). [G.]

Includes a description of damage by *Camponotus herculeanus* to living trees, mainly Pine, but also Spruce and Birch. The ants preferred damaged trees, entering through wounds, to build their nests in the heartwood. The trees, so weakened, were highly susceptible to wind damage.

3420. MICHENER, C. D., and SZENT-IVANY, J. J. H. Observations on the biology of a leaf cutter bee "*Megachile frontalis*" in New Guinea. *Papua N. Guinea agric. J.* 13 (1), 1960 (22-35). 22 refs. E.M.B.

Common in the eastern half of the eastern archipelago, it is sometimes an important defoliator of Eucalypts, *Cassia* spp., and *Terminalia* spp. Its biology and distribution are reported in detail. Lists are given of plants pollinated and species the leaves of which are cut.

Diptera

See No. 2731.

459. Other Animals

3421. RÜHM, W. Nematoden und Forstpflanzen. Untersuchungen über die Verbreitung, Verschleppung und Dispersion der wandernden, pflanzenparasitären Nematodenarten in Forstbauschulen und Forstkamps. [Nematodes and forest plants. II. The spread, movement and distribution of migratory, plant-parasitic nematode species in forest nurseries.] *Anz. Schädlingsk.* 33 (12), 1960 (177-83). 10 refs. [G.]

Discusses the occurrence of plant-parasitic nematodes and factors affecting (1) the movement and development of populations and (2) the distribution of different species within the nursery. Observations in conifer nurseries are reported [cf. *F.A.* 21 No. 4716].

3422. WHITEHEAD, A. G., and KARIUKI, L. Root-knot nematode surveys of cultivated areas in East Africa. *E. Afr. agric. For. J.* 26 (2), 1960 (87-91). 6 refs.

Of four root-knot species, *Meloidogyne javanica* and *M. incognita acrita* were found throughout the Kikuyu division, Kiambu district, Kenya. Both were found on Black Wattle, a new host record for the second. An unknown *Meloidogyne* sp. also occurred on the Wattle. The occurrence of two or more species on the same root system is a fairly common phenomenon; *M. javanica* and *M. incognita acrita* were often found associated in this way.

3423. KURIR, A. Die kleinen Borstenwürmer—Enchytraeidae—als primäre Schädlinge an Sämlingen und verschulten Fichtenpflanzen in einem Forstgarten. [Enchytraeidae as primary pests of

seedlings and Spruce transplants in a forest nursery.] *Allg. Forstztg.* 72 (1/2), 1961 (7-11). 23 refs. [G.g.]

Describes observations in a nursery in Carinthia where Enchytraeidae of the genus *Fridericia* caused serious damage by feeding on the bark of shallow roots and the subterranean part of the stem, in many cases girdling them completely. The worms, which had been introduced into the soil with the compost in great numbers and presumably lacked decaying food, attacked in clusters of 15-20 per plant. Treatment of the compost with lime, and crop rotation, are suggested for prevention, and soil injections with CS₂ or DD for control, but it is pointed out that DD, which was very successful in the laboratory, is poisonous to both man and plants.

46. Damage by Man

See also Nos. 2897, 2934, 3143.

3424. ANIĆ, J. O svojstvima tla u jednoj degradiranoj šumi *Querceto-Carpinetum*. [Properties of the soil in a degraded *Querceto-Carpinetum* forest.] *Glasn. šumske Pokuse* No. 14, 1960 (35-48). 10 refs. [Croat.e.]

Examines the physical and chemical properties of the soil in a 90 × 20-m. sample plot in Sessile Oak/Hornbeam coppice at Maksimir, near Zagreb. Human influence (trampling of the soil, removal of litter, felling) has been considerable, and, on one section of the plot, soil compaction, increased acidity, poor water relations, etc., are associated with dying-off of Hornbeam.

48. Injuries Due to Unknown or Complex Causes

3425. PATTON, R. F., and KREBILL, R. G. Deterioration of immature Jack and Red Pine plantations in Wisconsin. *For. Res. Note Wis. Coll. Agric.* No. 64, 1960. pp. 3.

A paper already noticed in abstract form [see *F.A.* 22 No. 2175].

3426. CURSCHMANN, O. H. Über die sogenannte "Ackersterbe" der Kiefer und ihre waldbaulichen Auswirkungen. [The mortality of Pine on agricultural land, and its silvicultural effects.] *Forst u. Jagd* 10 (10), 1960 (464-5). [G.]

In Hagenow district [Mecklenburg] where *Fomes annosus* damage was generally severe on former agricultural land, it was absent from areas that had been cultivated for some 50 years only, after forest clearance. In open and gappy Pine stands underplanted with various species, mortality declined and the growth checks common in the pole stage were overcome sooner, suggesting an increase of soil fungi antagonistic to *F. annosus*.

3427. VAJDA, Z. Uloga pojave ekstremnih klimatskih stanja u sušenju bukovih sastojina na Učki. [The role of extreme climatic conditions in the dying of Beech stands on Mt. Učka.] *Glasn. šumske Pokuse* No. 14, 1960 (5-34 + 4 pp. of photos). 15 refs. [Croat.g.e.g.]

A longer version of an article already noticed [cf. *F.A.* 18 No. 529].

3428. FREIER, R. VON. Schleimflusskrankheit an Birke und anderen Holzarten. [Slime-flux disease on Birch and other woody species.] *Forst- u. Holzw.* 16 (2), 1960 (55-6). [G.]

A disease, resembling that of Beech [cf. *F.A.* 21 No. 2148; 22 No. 652], is reported on Birch in the Göttingen area, and also on single specimens of Aspen, Sycamore Maple and Oak.

3429. NIȚU, G., and TUTUNARU, V. Cercetări asupra umidității lemnului de stejar verde și în curs de uscare din stejăretele înmlășinate. [Studies on the moisture content of the wood of healthy and dieback Oaks on marshy sites.] *Rev. Pădurilor* 75 (9), 1960 (525-7). 4 refs. [Rum.russ.g.f.e.]

Measurements were made of m.c. in disks taken at different heights from four 70-year-old *Quercus robur* trees, 2 healthy (a) and 2 suffering from dieback (b), from a marshy site, separate measurements being made for each of the cardinal points and for sapwood (s.w.) and heartwood (h.w.). M.c. % of h.w. did not fall below 55 in (a), but dropped to 48 in (b), this difference being apparent throughout the length of the stem. M.c. % of s.w., on the other hand, was higher in the basal parts of (b) stems than of (a), the difference decreasing in the upper parts. M.c. in a cross-section varied much more in (b) than in (a). Measurements of rate of ascent of sap [method not stated] were also made on a number of trees in September, and a mean rate of 33.6 m./hr. was found for (a) vs. 11.7 for (b).

3430. HERPKA, I. Nova pojava odumiranja kore na topolama. [New occurrence of bark necrosis on Poplars.] *Topola, Beograd* No. 15, 1960 (19-21). [Serb.f.]

The disease, noted on young Poplars in nurseries in N. Yugoslavia since 1956, is always found on shaded plants in excessively wet soils, and is believed to be a physiological disorder.

3431. RAYMOND, F. L. An unusual wilting and dieback of Yellow Birch [*Betula lutea*] saplings. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (2).

Describes a disorder affecting saplings growing on or along the edges of logging roads. Wilting and cankers (probably caused by *Phomopsis* sp.) were apparently sequels to frost damage or browsing, but it is not clear why freezing and browsing should have had this exceptional effect in 1960.

3432. LORTIE, M. Crown deterioration and tree diameter relationships in White Birch stands. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 16 (6), 1960 (1-2).

A study was made in more or less even-aged White Birch stands in Quebec to determine the relationship between degree of dieback and d.b.h. The results clearly indicate that, in even-aged White Birch stands, the slow-growing trees are the first affected and most seriously injured by dieback.

3433. FENTON, R. H., and DILLER, J. D. Sweetgum blight and dieback of associated hardwoods on the Beltsville Experimental forest in Maryland. *For.*

Res. Note Ntheast. For. Exp. Sta. No. 106, 1960. pp. 4. 4 refs.

A study in this experimental forest showed that nearly 50% of the Sweetgums (*Liquidambar styraci-*

flua) exhibited typical blight symptoms, whereas relatively few of the associated hardwoods showed crown deficiencies (>90% of them had sound healthy crowns). [Cf. *F.A.* 19 Nos. 751-2.]

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

3434. GUSEV, I. I. O stroenii el'nikov Arhangel'skoj oblasti. Soobščenie 1. 2. [The structure of Spruce forests in the Archangel region. 1. 2.] *Lesn. Ž., Arhangel'sk* 3 (1; 2), 1960 (21-8; 22-9). 14 refs. [Russ.]

Using data from 88 sample plots and numerous sample trees in even-aged mature and over-mature Spruce forests, varying from pure to 50% Spruce, presents in tables and graphs: stand structure by diameter; stand structure by height; the correlation of form quotient with tree height; the relation of crown length to stem diameter and to form quotient; the relation of tree form to stand density; and the correlation of crown width with stem diameter.

3435. PLAVŠIĆ, M. Prilog istraživanjima u čistim i mješovitim sastojinama poljskog jasena (*Fraxinus angustifolia* Vahl). [Investigations in pure and mixed *F. angustifolia* stands.] *Glasn. šumske Pokuse No. 14*, 1960 (259-313). 31 refs. [Croat.g.g.]

A full account of work already reported in part [see *F.A.* 18 No. 4439]. The ecology of *F. angustifolia* and the types of stand in which it occurs are described. Data given for different stand types include: age structure; stem height; d.b.h. of trees of mean b.a.; d.b.h. increment.

'qualifying' trees are counted and checked in the office, and thus observer bias can be studied and eliminated. Three different 'qualifying' tree widths were used on the photographs, and tree counts were made on each of 4 photographs for each width tested. The b.a. of the stand was measured by diameter tape on a permanent sample plot. Mean b.a. was estimated from the photographs, to within ca. 5% for each width, but errors for single photographs (i.e. single sampling points) were up to ca. 25%. These results are about the same as would be obtained from angle-count instruments generally, but there are some disadvantages peculiar to this method (e.g. trees hidden from the camera, and corrections for uneven ground).

3438. BLUTEL, Y. Mesures de volumes au Relascope de Bitterlich. [Measurement of volume by means of Bitterlich's Relascope.] *Rev. for. franç.* 12 (12), 1960 (775-88). 10 refs. [F.]

Expounds Bitterlich's method of volume determination with the help of the Relascope, based on Pressler's formula [cf. *F.A.* 20 Nos. 4970-1].

3439. ALLEN, R. H., JR., and MOGREN, E. W. Range-mean ratio of basal area as an indicator of Bitterlich sampling intensity in Lodgepole Pine. *Res. Note Colo. Coll. For. Range Mgmt.* No. 13, 1960. pp. 2.

Presents a table showing the number of sampling points needed in determining stand volume for various sampling errors and range/mean ratios. The latter are obtained by (1) making 5-10 randomly located b.a. estimates with an angle gauge from within the stand and (2) dividing the difference between the highest and lowest estimates of b.a. by their mean, the quotient being the range/mean ratio. The method proved satisfactory in field tests in 7 areas of N.E. Colorado.

3440. VUOKILA, Y. Relaskooppimenetelmän tarkkuudesta puuston arvioinnissa. [On the accuracy of the Relascope method of cruising.] *Commun. Inst. For. Fenn.* 51 (4), 1959. pp. 62. 55 refs. [Finn.e.]

Four forest areas, totalling 407.7 ha., were surveyed, and relascope results compared with those obtained by a complete enumeration or by the circular sample-plot method. In preliminary tests, the Swedish "skogstax" relascope and a new relascope designed by the author [both illustrated] were found to be the most accurate and convenient for field work. It was also found that relascope instruments that allow a free view of the surroundings and are equipped with a transparent red relascope plate, are superior to others, particularly to optical ones, in which the lack of light is often a

521. Diameter (Girth) and Sectional Area

See also Nos. 3441, 3496.

3436. FREI, S. Durchmesserermittlung durch Umfangmessung oder Kluppung? [Determination of diameters by measuring girth or by calipering?] *Repr. from Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 8 (4), 1959 (927-8). 5 refs. [G.]

When 900 trees in the 20- to 40-cm. d.b.h. classes were measured by 3 crews, girth measurement gave mean values ca. 2% higher than cross-calipering. Differences between crews were about the same—up to 1%—for both methods. The differences between the two diameters calipered increased with diameter. They were in the range 3-6-5% for Spruce and 3-1-5-7% for Pine. *From author's summary.*

3437. [Measuring basal area from photographs of angle-count 'sweeps'.] *Extr. from Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (23).

The first formal test of ground photography as a substitute for the eye and angle-count instruments in measuring stand b.a. was made in a young Douglas Fir stand at Whakarewarewa, chosen because it is open, on level ground, and has no undergrowth. The advantage claimed for the method is that

handicap, and which put a strain on the observer. S.E.'s of estimates of b.a., mean height, and cubic volume were calculated. Estimates were made of d.b.h. distribution, species relations, mean increment %, mean bark %, and mean volume increment. It is concluded that the angle-count method of cruising is rapid and economical, and sufficiently accurate for most purposes required for forest surveys in Finland.

522. Height, Length

3441. VUOKILA, Y. Pituus- ja kapenemismittausten tarkkuudesta. [The accuracy of height and taper measurements.] *Metsät. Aikak.* 1960 (11), (381-2, 411). [F.i.e.e.]

Height measurements with the Lönnroth hypsometer and the Blume-Leiss altimeter both proved, when compared with measurements on sample trees, to have a low standard error (± 2.8 and $\pm 2.3\%$ respectively); both instruments are suitable for practical work. The S.E. obtained in measuring diam. at a height of 6 m. for estimating taper, using a curve caliper on a pole, was also satisfactorily small ($\pm 3.25\%$). The S.E. for tree volume, combining those caused by errors in height and in taper determination, was $\pm 4.6\%$. From author's summary.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 3438, 3441, 3452.

3442. HENGST, E. Die Schaftform der Weymouthkiefer. [The stem form of *Pinus strobus*.] *Repr. from Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 8 (4), 1959 (921-5). 5 refs. [G.g.]

Presents, in supplementation of data already published [cf. *F.A.* 21 No. 2172], true and artificial diameter-quotient series and a table of artificial form factors based on the same material. In a moderately thinned stand, *Pinus strobus* had less taper than Scots Pine, Spruce, Douglas Fir or Japanese Larch.

3443. DUHOVNIKOV, JU. Tablici za naturalnité vidove čísla po stáblena pálnodávesnost za belija bor. [Tables of 'natural form factors' for stem taper classes of *Pinus sylvestris*.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (169-86). 6 refs. [Bulg.g.]

Analogously with earlier work [see *F.A.* 21 No. 4732], derives natural taper and slenderness factors [defined], and presents and discusses tables showing (1) the basic 'natural form factor' in relation to taper; (2) the coefficients of the straight lines expressing the relation between the basic natural slenderness factor and d.b.h./ht. for various taper classes; (3) the basic natural slenderness factors for various taper classes and values of d.b.h./ht.; and (4) the basic natural form factors and natural coefficients of taper for various taper classes and values of d.b.h./ht.

3444. STIELL, W. M. Taper curves and volume tables for plantation Red Pine [in Ontario]. *Tech. Note For. Br. Can.* No. 90, 1960. pp. 18.

Based on pure plantations from 17 to 35 years old, both thinned and unthinned.

3445. WOODFIN, R. O., JR. Taper in Black Hills Ponderosa Pine sawtimber trees. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 52, 1960. pp. 3. 2 refs.

524.3. Volume of Tree Groups and Stands

See a so Nos. 3444, 3497.

3446. EMROVIĆ, B. O najpodesnijem obliku izjednađbene funkcije potrebne za računsko izjednačavanje pri sastavu dvoulaznih drvnogromadnih tablica. [The most suitable form of the function for mathematical computation in constructing volume tables based on two variables.] *Glasn. šumske Pokuse* No. 14, 1960 (49-126). 40 refs. [Croat.g.g.]

The suitability of various simple functions was tested against data from 6926 Beech sample stems from Garjevica forest, Moslavacka Gora. The Schumacher-Hall logarithmic function proved the best, especially in mature stands, though it was not suitable for young stands or stands with a high % of stems <20 cm. in diameter.

3447. EMROVIĆ, B. Dvoulazne tablice drvnih masa za jelu u Gorskom Kotaru. [Double-entry volume tables for *Abies alba* in Gorski Kotar.] *Šum. List* 84 (11/12), 1960 (345-56). 4 refs. [Croat. e.]

Tables, arranged by 1-m. ht. and 2-cm. d.b.h. gradations, are presented for two important parent-rock types in this region: (1) silicate (bearing even-aged stands), based on 424 trees; (2) calcareous (selection forest), based on 126 trees. The methods used in compilation are discussed, and comparisons drawn with Schuberg's (1891) tables for *A. alba*. The number of trees measured (data tabulated) was insufficient for the tables to be regarded as permanent.

3448. VUOKILA, Y. Lehtikuusen kuutioimisytälöt ja -taulukot. [Tree volume functions and tables for Larch.] *Commun. Inst. For. Fenn.* 51 (10), 1960. pp. 89. 12 refs. [F.i.e.e.]

The tables were based on 2813 sample trees of *Larix decidua* and *L. sibirica*, and are given (a) including and (b) excluding bark. Functions for cubic volume excluding bark have been calculated separately for trees >10 m. and ≤10 m. high, and for d.b.h.o.b. and d.b.h.u.b.

3449. GLĄBIŃSKI, J. Badanie dokładności tablic miąższości Grundnera-Schwappacha w dwóch drzewostanach sosnowych Borów Tucholskich. [Testing the accuracy of the Grundner-Schwappach volume tables in two Scots Pine stands in the Tuchola forests.] *Sylvan* 104 (9), 1960 (53-69). [Pol.russ.e.]

In further work [cf. *F.A.* 20 No. 2143] the tables were found to be more accurate than at Rogów, but gave volumes too great in stands >80 and too low in stands <80 years old.

3450. GAINES, E. M., and PETERSON, G. Cubic-foot volume tables for Southwestern Ponderosa Pine.

Sta. Pap. Rocky Mt. For. Range Exp. Sta. No. 50, 1960. pp. 15.

The tables are in two parts—(a) for young, rapidly tapering trees ('blackjacks') and (b) for older trees with less taper ('Yellow Pines and intermediates'), based on measurements made in Arizona. Tables are also given for conversion of cu. ft. to cords and vice versa.

3451. OSMASTON, H. A. *Volume table for Eucalyptus saligna poles. Tech. Note For. Dep. Uganda No. 88 (60), [1960?]. pp. 1. 1 ref.*

For girths o.b. of 10, 20, 25, 30, 36, and 48 in. and lengths of 5, 10, 15, . . . 50 ft., giving a range of u.b. volumes from 0.15 to 28 cu. ft. The table is suitable for *Cupressus macrocarpa* with a similar taper (0.1 inch/ft.) and for other softwoods and Eucalypts grown at normal densities.

3452. DAWKINS, H. C. *Eucalyptus taper and volume by diameter limits. Tech. Note For. Dep. Uganda No. 83 (60), 1960. pp. 4.*

Gives for *E. saligna* (applicable to other species), a volume taper table reading against d.b.h. o.b. 4–14 in. and total heights 60, 70, . . . 120 ft., the volumes up the bole to various limiting u.b. diameters (and corresponding heights). Average figures for bark % (for 3 areas) are also given.

3453. Stamvormonderzoek. [Stem-form analysis.] *Extr. from Jversl. Landsbosbeh., Paramaribo 1959 (26, iv, + 2 gphs., 2 tpls.). [Du.e.]*

In the Mapane area of Surinam a number of felled trees of 7 species were measured in sections; volume tables from the data obtained are given. In the Coesewijne area measurements of standing trees were made for 8 species; a volume table is given for *Dicorynia guianensis* and *Ocotea rubra* from the data obtained.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See No. 3455.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 2970, 3437–40, 3459, 3497, 3941, 3945.

3454. SEPEROVIČ, I. P. *Izučennost' lesov SSSR. [Study of the forests of the U.S.S.R.] Lesn. Ž., Arhangel'sk 2 (4), 1959 (171–3). [Russ.]*

Describes the various kinds of survey (mainly aerial) being made in the U.S.S.R. in order to produce a forest inventory of the whole country, indicating progress to date.

3455. BAKER, R. D., and HUNT, E. V., JR. *Continuous forest inventory with punched card machines for a small property. Bull. Dep. For. S. F. Austin St. Coll., Texas No. 5, 1960. pp. 51. 37 refs.*

A detailed step-by-step description and cost analysis of a 1% sample survey involving 110 circular 0.2-acre plots on a 10 × 20 chain grid, in a Texas forest of ca. 2500 acres. Preparation and planning, field work with mark-sensing cards, card processing,

the preparation of tables, and a final report are discussed. An accuracy of $\pm 9\%$ for pulpwood and $\pm 11.5\%$ for sawtimber at the 95% confidence level was considered adequate. Although the cost per acre of this first inventory (\$1.40) was more than that of a conventional volume cruise using aerial photographs, it is thought to be justified by the additional information obtained. Machine processing, at \$0.33/acre was much more costly than for large areas but only slightly more so than calculation by ordinary methods. Remeasurements, planned every 5 years, will, of course, be cheaper. Appendixes give details on the design of the mark-sense and various punched cards used, overlays employed for detecting errors and omissions, a flow-plan and the chief results.

3456. PLAVŠIĆ, M., and KLEPAC, D. *Strukturni odnosi posavskih šuma obzirom na broj stabala, temeljnicu i drvenu masu. [The structure of the forests of the Sava basin with reference to the number of stems, basal area and volume.] Glasn. šumske Pokuse No. 14, 1960 (314–58). [Croat.f.f.]*

Describes 12 permanent sample plots established at Lipovljani (100 km. S.E. of Zagreb) on a *Querceto-Genistetum elatae* site, typical of the Sava flood-plains. The volume, b.a., and number of stems are tabulated for each plot by diameter class and species, the most important being *Quercus robur*, *Fraxinus angustifolia*, *Ulmus campestris*, *Ahulus glutinosa* and *Carpinus betulus*. Species found in the shrub and herb layers are also listed.

3457. HALAJ, J. *Matematicko-štatistické metódy i hospodárskej úprave a pestovaní lesa. [Mathematical and statistical methods in forestry.] Vydavateľstvo Slovenskej Akadémie Vied, Bratislava. 1960. pp. 340. [Slovak.g.] From review in Schweiz. Z. Forstw. 111 (11), 1960 (658–9). [G.]*

Discusses the author's system of sample surveys, using the coefficients of variation of d.b.h. or volume [cf. *F.A.* 19 No. 4589] as a means for determining sampling density and plot size. A nomogram is included for computing the errors of sub-populations (species, diameter classes etc.) from the standard error of the whole, and also the following additional papers: Development, increment and structure of the selection forests of Smolnicka Hirta (*M. Holubčík*); Dendrometric evaluation of thinning and increment in Spruce (*J. Borota*) [concluding from measurements of the residual stands on two plots after 6 hypothetical thinnings that heavy low thinning would produce the most "normal" diameter distribution and the highest increments]; and The structure of an Oak pole stand (*S. Korpel'*) [cf. *F.A.* 21 No. 1790].

3458. LAMPRINOS, G. *Dasotechnika apotelesmata tēs ektimēsēōs xylōdous onkou systadōn dia kanonikēs deigmatolēpsias dokimastikōn epiphaneion eis dasos. Phlampourariou-Ēpeirou. [Volume estimation of stands by sample plots in the Flambourari forest in Epirus.] Das. Chron. 2 (24), 1960 (1054–9). [Gk.]*

Gives detailed results of the operations [cf. *F.A.* 22 No. 2214] including data on c.a.i.

525. Volume by Assortments. Merchantable Volume

See also Nos. 3268-9.

3459. WIROATMODJO, R. A., and MOEKLAR [MUKLAR] EFFENDI, R. Hasil penebangan jang meningkat dan taksasi massa pada hutan^a djati. [Increased felling yield and the estimation of volume in Teak forests.] *Rimba Indonesia* 7 (10/12), 1958 (462-75). [Jav.jav.e.]

The increased demand for Teak in Indonesia in recent years, and the consequent reduction in quality requirements, have led to the felling of a greater volume of timber per ha. and consequently to a higher exploitation factor, a [a factor varying with the economic situation, generally between 5 and 8]; before the war, the highest value for a was 10. Calculation of a in a natural Teak forest after the war, using a formula based on total volume of crop, site quality and stand quality, give a value of 13.2. Crop volume of mature Teak plantations has in the past normally been calculated as timber volume but in present conditions it can best be calculated as stemwood volume, i.e. as containing some lower-quality material. Results of a study in a Teak plantation showed an actual crop of 119.7 cu. m./ha., whereas calculated figures were 65.52 cu. m. expressed as timber volume and 125.09 cu. m. expressed as stemwood volume. With $\frac{1}{10}$ -ha. circular-plot sampling, in a heterogeneous natural Teak forest, the error was 16.2% above that for 100% cruising and the crop volume 51.9% of the estimated volume, whereas in a Teak plantation the corresponding figures were 13.05% and 81.53%. From authors' summary.

3460. KALLIO, K. Metsäalueen puumäärien arvioiminen. [Estimation of the timber quantities of a forest area.] *Metsät. Aikak.* 1960 (11), (378-9, 411). 4 refs. [Fie.e.]

Volumes of sawlogs, pulpwood and fuelwood from 6 farm forests were assessed. Values for usable wood varied from 92 to 96% of the total volume.

526. Log Measurement. Scaling

3461. LEONT'EV, N. Opredelenie ob'ema partii lesomaterialov po vesu. [Determining the volume of timber lots by weight.] *Lesn. Prom.* 1961 (1), (28-9). [Russ.]

Presents an approximate method (which still requires improvement and completion) of determining volume by weight. It involves the use of formulae (presented) for finding the wood density of various species at moisture contents $>$ and $< 30\%$, and corrections for bark %. Dividing the weight of the timber lot by the wood density at the given m.c. gives the volume of the lot (logs or sawn timber).

3462. MEYER, K. R. Data sheet A-1a. Weight of wood per cord. *Pulp Paper Mag. Can.* 61 (11), 1960 (506).

Shows in a graph the relation of oven-dry weight per cord to green weight per cord and m.c.

527. Solid Volume of Stacked Products (including Converting Factors)

See also No. 3462.

3463. WOODFIN, R. O., JR., and LANDT, E. F. Conversion of cubic-foot volumes of Black Hills Ponderosa Pine to cords. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 31 (rev.) 1960. pp. 2. 3 refs. [Cf. F.A. 20 No. 2159.]

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 3089, 3336, 3434, 3488, 3494.

3464. KOROTJAEV, L. V. Ves krony elovyh derev'ev v lesonasaždenijah Severa. [The weight of Spruce crowns in forests in the N. of the U.S.S.R.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (90-7). 2 refs. [Russ.]

The studies were made in several leskhozeh in 1956-58, in stands of height class IV, mean d.b.h. 20 cm., mean stem volume 0.25-0.28 cu. m. In all, 101 felled trees were weighed (97 Spruce, 3 Birch, 1 Pine), 57 in winter, 44 in summer. Crown weight (c.w.) was taken as the difference between the full tree (with crown) and the tree-length log. Results were analysed statistically. The variation of c.w. with stem diameter is given in an equation and graph. C.w. was proportional to stem volume (in stems > 1 cu. m.). As stem volume increases from 0.01 to 0.2 cu. m., there is a sharp drop in the crown % (i.e. the relation of c.w. to stem weight expressed in %); as stem volume increases from 0.2 to 1 cu. m., the crown % becomes fairly stable at ca. $\frac{1}{3}$ of stem weight. C.w. plus bark is ca. $\frac{1}{2}$ of the stem weight with bark. The implications of this in skidding and transport are discussed. Tables and graphs of c.w. are presented.

3465. GULIDOVA, I. V. Opredelenie poverhnosti hvoi u eli. [Determining the needle area in Spruce.] *Soobšč. Inst. Les.* No. 11, 1959 (49-50). 1 ref. [Russ.]

The variation in the weight and mean cross-sectional perimeter of a needle 1 cm. long, with the degree of illumination, position in crown, and tree age, is tabulated, and from this the surface area per 1 g. of needles is found for 27 various conditions, e.g. it is 64, 50 and 48 sq. cm. respectively for needles at the bottom, middle and top of Spruce in a stand ca. 100 years old on a podzol of site class II, and 147 sq. cm. for needles on 3-year-old advance growth under the canopy.

3466. DANILOV, M. D., and STEPANOV, V. S. Listovaja massa i effektivnost' ee dejatel'nosti v pjatnadcatiletnem nasaždenii topolja bal'zamičeskogo. [The leaf mass and its efficiency in stands of *Populus balsamifera* 15 years old.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (8-12). [Russ.]

[Cf. F.A. 21 No. 826.] The trees on an experimental plot were divided into 5 categories on the basis of rate of development and growth (a division proposed by the authors). Four sample trees of each category were felled, and the leaves collected and divided into (a) light, (b) intermediate, and (c) shade leaves. Tables are presented showing

moisture content of fresh leaves, oven-dry weight of leaves, and single-surface area per g. of leaves (both fresh and dry) for the five tree categories and for (a), (b) and (c). A further table shows the fresh and oven-dry weight of (a), (b) and (c) leaves in relation to stem d.b.h., e.g. total fresh-leaf weights of trees of 2, 5, 10 and 12 cm. d.b.h. are 0.160, 1.226, 4.156 and 5.889 kg. respectively; oven-dry weights 0.055, 0.365, 1.256 and 1.893 kg. The relationship between leaf weight and stem diameter is roughly linear. Total fresh-leaf weight per ha. was 33,905 kg. (54% being (a), 28% (b), and 18% (c) leaves); total oven-dry leaf weight per ha. was 10,289 kg. (56% (a), 26% (b), and 18% (c)); total leaf surface area per ha. was 130,026 sq. m. (44% (a), 30% (b), and 26% (c)). Another table shows the relation between the weight and area of leaves per ha. and per cu. m. of stemwood.

3467. MATUSZ, S. Metoda określania ażurowości pułapu drzewostanu. [A method of defining the "openness" of the stand canopy.] *Prace Inst. Bad. Leśn.* No. 202, 1960. pp. 80. 38 refs. [Pol. russ.e.g.]

"Openness" (O) is the term coined by the author for expressing canopy density, being the ratio of the total area of the projection of all gaps in the canopy (P_1) to the total area of projection of the canopy itself (P). Various instruments used in this connexion are discussed [cf. *F.A.* 13 No. 3223; 14 No. 914; 15 No. 2746; 17 No. 4271]. A detailed description is given of a new mirror instrument, the "Ażurometr", devised by the author, which enables one to define numerically the P_1/P ratio. Tests were made with the instrument to determine the relation of O to the light intensity in the stand and to the penetration of precipitation, the variation in O with varying environmental conditions and with season, the relation between O and natural regeneration by seed, etc. A 5-point scale of O is proposed, and the practical use of the instrument discussed—e.g. the number and location of observations required. A 4-page English summary gives most of the salient points.

3468. IVANJUTA, V. M. Polnodrevesnost' nasaždenij važnejšij lesovodstvennyj pokazatel'. [Standing volume/mean height—an important stand index.] *Lesn. Hoz.* 12 (6), 1960 (20–2). [Russ.]

The index, K, is the numerical value of M/H , where M is standing volume [in cu. m.] per ha., and H is the mean height [in m.]. A study was made on 181 sample plots in the Komi A.S.S.R. to find how K varied in Scots Pine and Spruce stands of site classes V and Va. The mean value of K in Pine was 10 in class V and 8 in Va; in Spruce it was 11 and 9 respectively. The necessary sample-plot area F, i.e. the area on which the number of trees multiplied by H gives standing volume in cu. m./ha., is got by the equation F (in sq. m.) = 10,000 gf , where g is the b.a. of the mean tree in sq. m., and f is the form factor. Values for F are shown graphically for various site classes, giving a straight line expressed by $(0.448 \times g) + 5.2$ for Pine, and by $(0.476 \times g) + 9.4$ for Spruce. The implications and possibilities of these findings in mensuration work are discussed.

54. Assessment of Site Quality

See also Nos. 2669, 2698, 2853, 2886, 3267–9, 3488, 3494, 3961.

3469. TRYON, C. P., BEERS, T. W., and MERRITT, C. The measurement of site quality for Yellow-Poplar. *J. For.* 58 (12), 1960 (968–9). 4 refs.

Tests of reported criteria of growth [cf. *F.A.* 7 No. 1441] in a 14-year *Liriodendron tulipifera* plantation in Indiana, using a Hoffer profile tube, showed a highly significant multiple correlation between (a) tree height, and three soil factors, viz. (b) thickness of A_1 horizon; (c) depth to tight sub-soil; (d) depth to mottling. While (b) showed the best correlation with (a), (c) and (d) also were each significantly (at 1% level) correlated with (a). Survival of planted trees was related to the level of the water table. When standing water was found within 9 in. of the surface, survival was poor, with water at a depth of 16 in. it was fair, and was good only with the water table at depths of ≥ 24 in.

3470. NIKITIN, K. E. O raspredelenii semennyh nasaždenij po klassam boniteta. [The distribution of high-forest stands by site classes.] *Lesn. Ž.*, *Arhangel'sk* 3 (2), 1960 (166–7). [Russ.]

Presents a general table for determining site quality by height [presumably for any species] for stands aged 10, 15, 20... 100, 110, 120... 200 years.

56. Increment. Development and Structure of Stands

See also Nos. 2695, 2853, 2932, 2941, 2953, 2956 *et seq.*, 3055–60, 3086 *et seq.*, 3324, 3347, 3408, 3432, 3457.

3471. ABETZ, P. Über den Wachstumsablauf japanischer Lärchen und Fichten auf gleichem Standort. [The growth patterns of Japanese Larch and Norway Spruce on the same sites.] *Allg. Forst- u. Jagdztg.* 131 (11; 12), 1960 (241–53; 266–80). 93 refs. [G.g.e.]

A detailed study of the development of height, diameter, b.a., volume, crown and roots of 40 pairs of mostly dominant, neighbouring Spruce and Larch in even-aged mixtures of ages up to ca. 60 in the Lake Constance region, Upper Swabia, and in the Black Forest. Height growth was influenced chiefly by temperature in the early stages, and by the water regime later (i.e. not by the nutrient status of the sites). Three different growth patterns could be distinguished according to whether water supply was favourable throughout, or unsatisfactory (e.g. excessively wet or cold soils) or sufficient in youth but insufficient later. These types were more clearly defined in Larch than in Spruce. Larch made the greater height growth at first, but Spruce overtook it in height before age 50 on all but the best Larch sites, and generally also in b.a. so that, at age 50, the mean stem volume of Larch was only ca. 15% more than that of Spruce (as against 60% more at age 30), despite considerably larger crown areas. Both species showed a similar capacity for their roots to penetrate in depth, and similar rooting habits, but in Larch the weight of roots > 2 cm. in diam. per unit volume of soil was ca. 50% greater than in Spruce. Root analysis of two Larch

trees showed that root diameter-growth largely corresponded to d.b.h. growth. Roots lengthened up to 1 m. annually in early youth, but later only ca. 30 cm. Elongation of Larch branches was correlated with height growth. B.a. increment in both species showed fairly close correlation with precipitation, but in some years one species did better and the other worse than in the preceding year. In Larch, b.a. increment varied little with age; in Spruce it tended to rise, and at age 50, stand b.a. of Spruce, originally less than that of Larch, is twice as great for the same crown projection. The general opinion is confirmed that the Japanese Larch is suitable for temporary admixture, and should be replaced by the main species at an age ≥ 40 .

3472. FFOLLIOTT, P. F., IRVING, F. D., and DUNCAN, D. P. The growth potential of Black Walnut [*Juglans nigra*] in southeastern Minnesota. *Minn. For. Note No. 97*, 1960. pp. 2. 3 refs.

Gives the results of a study of age, diameter, height, and volume relationships from measurement of 72 trees aged 20–90 years.

3473. FFOLLIOTT, P. F., IRVING, F. D., and DUNCAN, D. P. The growth potential of Basswood [*Tilia americana*] in Southern Minnesota. *Minn. For. Note No. 98*, 1960. pp. 2. 3 refs.

Gives the results of a study of age, diameter, height, and volume relationships from measurement of 150 trees aged 20–80 years.

3474. TRIFUNOVIĆ, D., and POPOVIĆ, Č. Proizvodna sposobnost sastojina najraširenijih vrsta topola u AP Vojvodini. [The productive capacity of stands of the most widely used Poplar species in Vojvodina.] *Šumarstvo* 13 (7/8), 1960 (359–73). 19 refs. [Serb.f.f.]

Presents data on c.a.i./ha. for *Populus × robusta*, *P. × serotina*, *P. nigra* and *P. alba* plantations calculated from 320 sample stems cut on 22 plots in the Danube, Sava, and Tisa river areas. Regression equations derived from these data are given for height, b.a., and volume increment. An equation is also given for bark thickness.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also No. 3435.

3475. WEIHE, J. Die Beschreibung und Analyse des Höhenwachstumsablaufes von Fichten mit dem Wachstumsgesetz von Backman. [Height growth patterns for Spruce described and analysed with the help of Backman's growth law formula.] *Allg. Forst- u. Jagdztg.* 132 (1), 1961 (1–6). 8 refs. [G.g.e.]

When actual growth curves of Norway Spruce in Baden (obtained by stem analysis) were compared with a series of theoretical growth curves based on Backman's formula [cf. *F.A.* 14 Nos. 1420–1] assuming different final ages and heights and ages of maximum height increment, it was possible to

distinguish the innate growth pattern, i.e. the pre-determined decrease in growth rate, from incidental changes in growth rate caused by, e.g., thinning or loss of leader, better than by the usual comparison with yield-table data.

3476. KALININ, V. I. O roste listvennichnykh molodnjakov v učebno-opytном leshoze ALTI. [The growth of young Larch stands in the training and experimental leshkhoz of the Archangel Forestry Institute.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (29–34). 7 refs. [Russ.]

A statistically evaluated study was made in the Archangel region on the height growth of *Larix sukaczewii* and *Pinus sylvestris* in mixed stands. The findings are presented for two sample plots in dense Larch/Pine stands with some Birch, resulting from a burn in 1932. Under identical conditions, and at the same age (13–17 years), the Larch gives a height increment 10–25% greater than that of the Pine. In heavily thinned young stands, the leading shoots of Larch are sometimes frozen, but this does not happen in dense Larch/Pine stands with some Birch.

3477. Management of 'Kauri' forest. *Extr. from Rep. For. Dep. Brit. Solomon Islands Protect.* 1959, 1960 (5).

Measurement of sample plots of *Agathis macrophylla* indicate that a growth rate of 1 ft. in girth in 10–12 years can be tentatively assumed for large numbers of trees at Vanikoro. From measurements in the exploited forest, a rotation of ≥ 100 years would be indicated, but there is evidence that they reflect slow recovery from earlier suppression, and a shorter rotation might well be possible under optimum growth conditions.

3478. DOROFEEV, A. I. Sposoby proyavleniya godichnykh sloev osiny i berezy. [Methods of making visible the annual rings of Aspen and Birch.] *Lesn. Hoz.* 12 (6), 1960 (19–20). [Russ.]

Discusses the use of solutions of KMnO_4 and of $\text{K}_2\text{Cr}_2\text{O}_7$ for Aspen; and solutions of atebrian, and of para-aminophenol plus soda [NaOH ?] for Birch.

3479. VUOKILA, Y. Männyn kasvusta ja sen vaihteluista harventaan käsittelyssä ja luonnon-tilaisissa metsiköissä. [On growth and its variations in thinned and unthinned Scots Pine stands.] *Commun. Inst. For. Fenn.* 52 (7), 1960. pp. 38. 44 refs. [Fie.e.]

A study was made of radial growth at b.h. and at other fixed heights on the stem in stands of even-aged Scots Pine heavily thinned from below in 1929, in order to solve some of the problems connected with variations in increment. On each of 5 permanent sample-plot pairs, 16 sample trees were studied by boring to the pith at stump height, b.h., and then at 3-m. intervals as high up as possible. It was found that absolute variations of radial growth at b.h. were rather similar in thinned and unthinned stands, and major differences occurred in the first year after thinning. Relative variations of growth at b.h., as indicated by annual-ring indices, were surprisingly equal, irrespective of treatment. This is explained by the fact that the increase in

radial increment due to thinning appears chiefly in the first year after treatment, when it amounts to 12% in comparison with the last year before thinning. Later, the variations attributable to thinning are so small (1-5%) that they are reduced to insignificance by the fluctuations due to climatic causes. Study of absolute variations of growth at different heights on the stem showed that the radial-increment response to thinning is most marked in the lowest $\frac{1}{3}$ of the stem, slight or negligible in the middle, and may be even negative in the top section. Thus the rapid reaction of radial growth at b.h. after thinning is in part only an indication of changes in the vertical distribution of increment. Relative variations of increment at different heights are sufficiently uniform to justify the present practice of studying radial-increment changes at one height for purposes of practical inventories, and in natural stands breast-height boring is undoubtedly the most convenient way of studying variations due to climatic fluctuations; in thinned stands, however, such variations are more reliably studied if borings are made at a higher level, where the reaction to thinning is negligible, and for combined reliability and cheapness a height of 6 m. is recommended.

3480. GRIFFITH, B. G. Seasonal variations in radial growth at breast height of some Western Hemlock and Douglas Fir trees, 1953-57. *For. Chron.* 36 (4), 1960 (391-400). 1 ref.

Radial increment was recorded at weekly intervals for (a) 68 Douglas Fir and (b) 14 Western Hemlock throughout the growing season for the years 1953-57 inclusive. [For description of the plots etc. see *F.A.* 21 No. 4766.] Mean d.b.h. u.b. was 13.9 in. for (a), and 11.9 for (b). Growth for both species began in the 1st week of May. Average length of growing season for (a) was 146 and for (b) 156 days. A larger % of total growth was made early in the season by (a) than by (b) (83 and 68% respectively by 31 July). Growth in 1956 and 1957 was considerably below that of each of the 3 preceding years, and this is attributed partly to severe frost damage in Nov. 1955.

3481. FRITTS, H. C. Multiple regression analysis of radial growth in individual trees. *For. Sci.* 6 (4), 1960 (334-49). 19 refs.

Daily readings of radial growth and of concomitant environmental factors are examined (a) for 6 *Fagus grandifolia* trees over two growing seasons and (b) for 2 each of *Quercus rubra* and *Q. alba* and one of *Acer saccharum* over the early part of one season. A table shows for (a) the multiple correlation coefficients, and significance levels of partial regression coefficients, for soil moisture, maximum temperature, daily precipitation, mean wind velocity, humidity, % of sunlight on the day of growth and on the previous one, two and three days, all except the last two factors being shown in graphs. In (b) the variables measured were mean air temperature of the day and of the previous day, difference between maximum and mean air temperature and electrical resistance of the soil at a depth of 4 in. The effects of these factors on growth are discussed and the usefulness of this method, i.e. of examining the growth of individual trees, argued.

3482. EMEĽJANOV, JU. M., and NEKRASOV, V. I. Ob anomal'nom roste drevesnoj rastitel'nosti v rajone padenija Tungusskogo meteorita. [Anomalous growth of trees in the region where the Tungus meteorite fell.] *Dokl. Akad. Nauk SSSR* 135 (5), 1960 (1266-9 + 1 plate). 5 refs. [Russ.] A.P.B.

The meteorite fell in 1908. On the basis of an examination, in 1958, of surviving Larch, Pine and Spruce in the area, and trees which have come in since the meteorite fell, the authors discuss the increase in diameter growth which started in 1908 or soon after and still continues, the anomalous wood structure of the 1908-12 rings, and the formation of compression wood in up to 6 rings after 1908. The conspicuous increase in increment may be the result either of improved environmental conditions (more light, better nutrient supply after fire, deeper permafrost level, etc.) or of other, as yet unidentified, stimuli. Further research on the problem is urged.

3483. TOMAŠEVSKI, S. Odnos debljinskog prirasta gorskog brijesta i bukve u g. j. 'Ravna Gora'. [The relation between the diameter increment of Wych Elm and Beech in the 'Ravna Gora' management unit.] *Šum. List* 83 (10/11), 1959 (364-9). [Croat.croat.e.]

In two mixed compartments, a total of 194 (a) Wych Elm stems and 320 (b) Beech stems were examined. The culmination of diam. m.a.i. for (a) occurred at 45 and 50 cm. d.b.h. respectively, vs. 60 and 65 for (b). The minimum *temps de passage* (for 5-cm. diam. classes) was 16.0 and 16.9 years for (a) and 11.7 and 12.8 for (b). The relatively early culmination of diam. increment in (a) is attributed to Dutch Elm disease. Trees should not be allowed to reach >90 cm. d.b.h.; the species should, however, be maintained and spread where possible, as it has completely disappeared from some forest districts. Beech should be felled on reaching the culminating diameter m.a.i. [Cf. *F.A.* 21 No. 3559.]

562. Volume Increment

See also No. 3494.

3484. MILETIĆ, Ž. O metodici određivanja zapreminskog prirasta. [Methods in the determination of volume increment.] *Šumarstvo* 13 (5/6), 1960 (259-69). 6 refs. [Serb.f.]

Examines the principles of the determination of volume increment in selection forests, and develops formulae by Pressler and Leibnitz. [Cf. *F.A.* 22 No. 2257.]

3485. KLEPAC, D. Jedna stara praktična metoda računanja prirasta u prebornim šumama. [An old practical method of calculating increment in selection forests.] *Šum. List* 84 (7/8), 1960 (228-31). 2 refs. [Croat.f.]

Describes a method originally published by Schaeffer in 1908 and still in use in the French Alps, comparing it briefly with two other methods.

3486. JAROŠEVIČ, V. G. Ob opredelenii tekuščego ob'emnogo prirosta srublennogo dereva. [Determining the current volume increment from a felled tree.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (49-53). [Russ.]

The author discusses the accuracy of A. V. Tjurin's formula (1936) and M. L. Dvoreckij's modification, and constructs a complex formula of his own for volume c.a.i. The three formulae are compared.

3487. BATIAS, A. L'accroissement des futaies résineuses: étude statistique. [A statistical study of the increment of coniferous forests.] *Ann. Éc. Eaux For. Nancy* 17 (2), 1960 (237-63). 5 refs. [F.f.e.g.]

Describes, with detailed working of an example, a method of determining the m.a.i. of stands by combining the use of systematic sampling to obtain diameter distribution, estimation of *temps de passage* from increment cores, and calculation of volume m.a.i. per tree from the formula $dD = (V_{D+5} - V_{D-5})/2s$, where dD = increment in cu. dm. of a tree of d.b.h. D cm., V_{D+5} = volume in cu. dm. of a tree of d.b.h. $(D + 5)$ cm., V_{D-5} = volume in cu. dm. of a tree of d.b.h. $(D - 5)$ cm., and s = "*temps de séjour*" in the D diameter class.

564. Forecasting Increment

3488. BRENDER, E. V. Growth predictions for natural stands of Loblolly Pine in the lower Piedmont. *Rep. Ga. For. Res. Coun.* No. 6, 1960. pp. 7. 4 refs.

A study based on the full enumeration, at 5- to 12-year intervals, of 202 stands of varying stature, totalling 1552 acres, in Hitchiti Forest, Georgia, presenting predictions of annual growth by site index, age, and b.a. stocking in bd. ft. or cu. ft./acre. Optimum growth in cu. ft. occurred always at a b.a. stocking slightly less than the site index value.

565. Sample-Plot Technique

3489. ASIDDAO, F. Progress report on sample plots. *Filipino For.* 11, 1959 (69-77).

By April 1959, 334 permanent sample plots had been established in the Philippines since the war (when pre-war plots and records of measurements were destroyed). Their location, date of establishment, and the number of remeasurements taken, are tabulated. Results of some preliminary analyses of post-war data (e.g. for Teak and *Dipterocarpus* spp.) are given.

566. Yield Tables and Their Construction

3490. KLEPAC, D. Prirasne tablice za jelu na području fakultetske šumarije Zalesina. [Increment tables for *Abies alba* in the forest of Zalesina.] *Glasn. šumske Pokuse* No. 14, 1960 (359-82). [Croat.f.f.]

Presents tables for *Abies alba* based on height measurements of 3093 trees and increment cores from 3562 stems. Methods of preparation are described.

3491. SEMEČKIN, I. V. Hod rosta naibolee rasprostranennyh elovo-listvennyh drevostoev Leningradskoj oblasti. [Yield tables for the commonest types of Spruce/hardwood stands in the Leningrad region.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (24-9). 3 refs. [Russ.]

Presents yield tables for stands in the *Piceetum myrtillosum* (for ages 40, 50, 60 . . . 210 years, giving

the data separately for the Spruce, Birch, Aspen and Pine in these stands), and for stands in the *P. oxalidosum* (for ages 40, 50, 60 . . . 140, giving data separately for the Spruce, Birch and Aspen in these stands). A table of b.a. and standing volume for density 1.0 is given for mean stand heights of 10, 11, 12 . . . 29 m. for stands in both types.

3492. ZAHAROV, V. K., and ERMAKOV, V. E. Stroenie i hod rosta kedrovyyh drevostoev Zabajk'al'ja. [Structure and yield of *Pinus sibirica* stands in the Trans-Baikal region.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (7-14). 7 refs. [Russ.russ.]

Presents the results of studies on 22 sample plots in the two main *P. sibirica* forest types in Buryat Mongolia. Height and b.a. growth are graphed, and yield tables (40, 60, 80 . . . 220 or 240 years) constructed. It was found that *P. sibirica* has the same stem form as Norway Spruce, so that, where yield and volume tables for the appropriate site classes are not available for *P. sibirica*, tables for Spruce should be used (and not, as hitherto, those for Scots Pine). The formulae of both Weise and Kunze for the form factor gave very good results.

3493. FEKETE, Z. Az akácok újrafelvételeivel kapcsolatos tapasztalatok. [A remeasurement of *Robinia* sample plots.] *Erdő* 9 (3), 1960 (81-5 + smries. in suppl.). 4 refs. [Hu.russ.g.]

Contains data amending the author's 1937 yield tables. The volume increment curve of the main stand is steeper and total intermediate yields higher, owing chiefly to heavier thinnings.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also Nos. 2896, 3457.

3494. WATT, R. F. Second-growth Western White Pine stands: site index and species changes; normality percentage trends; mortality. *Tech. Bull. U.S. Dep. Agric.* No. 1226, 1960. pp. 60. 34 refs.

A study based on 94 permanent plots in the White Pine (*Pinus monticola*) type in Idaho, established in 1922. Changes in site index were very small; species composition changes very little after stands reach the age of 30 years. Regressions are developed for predicting changes in density as % of normal yield-table values of stocking; ca. half the mortality was due to wind and snow damage.

58. Surveying and Mapping. Aerial Survey

See also Nos. 3064, 3454.

3495. MYHRE, D. W., and MEYER, M. P. Tree image recovery on aerial photographs as affected by printing method and film. *J. For.* 59 (2), 1961 (97-9). 7 refs.

Films were taken within a period of a few minutes along identical flight lines in N.E. Minnesota, at a scale of 1 : 15,840, with two filter combinations, (a) panchromatic minus blue and (b) infra-red minus blue. The comparative image quality of prints of these films produced on a standard contact printer and on an electric printer at full scan was evaluated in tests with 3 interpreters. Little

difference in tree-crown image recovery was found between printing methods. The difference in recovery between (a) and (b) photography, however, was highly significant, and independent of printing method, (a) being superior. The interpreters showed personal preferences for (a) and for the standard method of printing. [Cf. *F.A.* 20 No. 3603.]

3496. MINOR, C. O. Estimating tree diameters of Arizona Ponderosa Pine from aerial photographs. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 46, 1960. pp. 2. 3 refs.

3497. SMITH, J. H. G., LEE, Y., and DOBIE, J. Intensive assessment of factors influencing photo-cruising shows that local expressions of photo volume are best. *Repr. from Photogramm. Engng.* June, 1960 (463-9). 9 refs.

Use of the electronic computer, Alwac III, has facilitated an intensive evaluation of factors that limit photo-cruising. Stand volumes measured in the field were estimated by means of 41 multiple-regression equations based upon ground- or photo-measured stand variables. Five variables, 19 interpreters, 5 stands, 2 kinds and 3 scales of photos, and 4 finishes of photos were assessed by means of correlation coefficients and the portion of the total variation in volume removed by each variable. Two of the interpreters worked on most phases of the project. The main study was based upon 15 plots near Haney, B.C., in a 40-acre block of young Douglas Fir, Western Hemlock, and Western Red Cedar. The form of the volume equation was investigated, and local equations were compared with standard volume equations and volume tables. It was concluded that the photo-interpreter himself is the most important source of variation; that crown closure and height are the most useful

variables; that, for photo-cruising, photographs secured at RF 1:14,400 with a 12-inch Ross camera are preferable to those at RF 1:15,600 or 28,800 taken with a 6-inch Wild RC8, and that use of positive transparencies did not improve photo-mensuration significantly. Because of the wide variation among results of interpreters measuring the same plots, and because of differences between stands, it was concluded that best results will come from localizing photo-volume tables or equations through use of appropriate statistical techniques. *From authors' abstract.*

3498. AVERY, G. Identifying southern forest types on aerial photographs. *Sta. Pap. Stheast. For. Exp. Sta.* No. 112, 1960. pp. 12.

Presents paired panchromatic and infra-red photographs taken simultaneously, in summer, in the coastal plains, piedmont, and mountains of N. Carolina and Georgia, of Longleaf/Slash, Longleaf/Loblolly, Shortleaf/Virginia and Loblolly/Shortleaf Pine types and of upland and bottomland hardwoods. Infra-red photos taken in spring or early summer are generally considered superior to panchromatic photos for delineating Southern forest types.

3499. ROLLET, B. Emploi de photographies aériennes au 1/40,000^e pour l'interprétation de la végétation et les inventaires forestiers au Cambodge et au Vietnam. [The use of aerial photographs on a scale of 1:40,000 for the identification of vegetation and for forest inventories in Cambodia and Vietnam.] *Bois For. Trop.* No. 74, 1960 (16-24). [F.e.span.] Identification of vegetation types was readily made on these photographs, but they did not prove suitable for the estimation of standing volumes.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 2930-2, 2941, 3269, 3477.

3500. DONIS, C. A. Aménagement intensif ou extensif des forêts tropicales. [Intensive or extensive management of tropical forests.] *Bull. Inst. Agron. Gembloux* 28 (2), 1960 (157-76). [F.f.] E.M.B.

According to the author, forest management is "intensive" when labour and capital are restricted to a relatively small area, and "extensive" when a large area is managed at relatively low cost. Problems of more intensive management of tropical forest are discussed with particular reference to the delimitation of the permanent forest area, planning the management of under-forested, adequately forested, and over-forested areas, and the necessity for further research in silvicultural techniques for tropical forests.

62. Methods of Management. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 3961-2.

3501. SZEL, E. Korszerű erdőművelés a Vértesi Állami Erdőgazdaságban. [Phased forest improvement in the State forest district of Vértés.] *Erdő* 9 (9), 1960 (349-54 + smries. in suppl.). [Hu.russ.g.]

Presents working-plan data and prescriptions for heavier cleanings and thinnings over ca. 40,000 ha., bringing the present total cut of 300 cu. m./ha. to 500 for a period of 20 years, the extra contribution being in intermediate yield. Thereafter a total cut of 480 cu. m./ha. is expected.

3502. MUDRICH, H. Die mathematischen Grundlagen der Berechnung des korrigierten Hiebsatzes. [The mathematical basis of calculation of the

corrected allowable cut.] *Forstarchiv* 31 (11/12), 1960 (193-7). [G.g.]

In connexion with the new draft management instructions for Nordrhein-Westfalen, providing that deficiencies or excesses of annual cuts over prescribed cuts be spread over the rest of the revision period instead of, as previously, over the following year, a simple formula is developed:

$$e_{i+1} = e_i + \frac{e_i - n_i}{d - i}, \text{ where } e_i \text{ is the prescribed}$$

cut for the i^{th} year of the period, n the actual cut, and d the number of years in the period.

64. Forestry as a Business: General

See also Nos. 3500, 3520-1, 3925, 3951.

3503. MANTEL, K. Die Standorts-, Intensitäts- und Preistheorien von Thünen in ihrer Bedeutung für den Standort der Forstwirtschaft. [Thünen's theories on siting, intensity, and prices [for different land-use industries] as applied to the siting of forestry.] *Allg. Forst- u. Jagdztg.* 130 (4/5; 6; 8/9; 11/12), 1959 (146-54; 165-72; 222-4; 265-70); 132 (1), 1961 (7-27). Many refs. [G.g.e.]

Includes a discussion of the relative changes in various production factors and prices of agricultural and forestry products since the early 19th century, and recent data on labour costs (wages and man-hour requirements), transport, financial yields/ha., and prices, for both industries in W. Germany, suggesting that in many parts of Germany, forestry is more profitable than agriculture.

3504. BOSSEL, H. Welche Möglichkeiten zur Hebung der Rentabilität des Forstbetriebs bieten sich dem Betriebsleiter von der Ausgabenseite her im öffentlichen Wald? [Possibilities for increasing profitability in public forests by reducing expenses.] *Forst- u. Holzw.* 16 (2), 1961 (45-51). 16 refs. [G.g.]

Surveys the whole range of operations in forestry, pointing out the main possibilities for reducing expenses (by simplification and by cutting out what is superfluous), e.g. increased use of natural regeneration, wider spacing, reduction of game populations, rational fencing, better road planning, mechanized barking, tightening up nursery management, etc.

65. Special Business Problems of Timber-Growing

See also Nos. 2935, 3045-6, 3048, 3056, 3059, 3065, 3068, 3094, 3212, 3524.

3505. GAFFNEY, M. M. Concepts of financial maturity of timber and other assets. *A.E. Information Series, Department of Agricultural Economics, North Carolina State College, Raleigh, N.C.* No. 62, 1960. pp. viii + 105. 70 refs.

A critical evaluation of various formulae that have been proposed by foresters and economists, by the method of marginal analysis. The author considers Faustmann's formula to have the greatest merits, and proposes certain modifications to make it more flexible, including a method of "borrowing" site values from future rotations, and adaptations for changes in mid-rotation. The rotations adopted by the U.S. Forest Service (based on maximum m.a.i.) and many other rotations common in

America are considered to be too long. The effect of taxes, etc., on rotation length are discussed. Various examples are worked out.

3506. BUESTAD, A. Eikeskogene på første bonitet er en tvilsom forretning. [Oak stands on the best site-class are only doubtfully economic.] *Norsk Skogbr.* 7 (4), 1961 (134-6). [Nor.]

Calculations taking account of cultivation costs (planting of Spruce vs. natural regeneration of Oak, pruning of Oak), increment, distribution of assortments, and prices, suggest that on Spruce site-class A, Oak will be unable to compete financially with Spruce. Detailed results and calculations will be published elsewhere.

3507. MACGREGOR, J. J. Some economic problems of forestry in Western Nigeria. Imperial Forestry Institute, University of Oxford. 1959. pp. ii + 184. 28 refs.

Answers questions posed by the Ministry of Agriculture and Natural Resources, W. Region on: (a) land use: the proposed surrender of forest reserve areas to rubber, cocoa and oil-palm plantations; (b) management: natural vs. artificial regeneration; (c) forest royalties, i.e. (i) equitable stumpage rates plus (ii) re-imbursment of forest owners by Government for forest use; (d) record keeping. In spite of admittedly greater financial returns from plantation crops, the reduction of reserve area is opposed on the grounds of the small area under forest and the growth of population and of the total national product, the danger of the precedent, and the availability of land outside. Conclusions on (b) are that to earn 4% on a 100-year rotation, the tropical shelterwood system must produce 15 times the current average if present royalties are charged, or ca. 5 times if the rotation were 60, 70 or 80 years. Raising both production and royalties, and reducing the rotation, may or may not prove successful economic solutions—a scepticism shared by Dawkins [*F.A.* 20 No. 2991], quoted in an appendix. Taungya plantations, though suitable sites are limited, offer a comparatively economic method of producing timber (detailed comparative costs appended). Under (ci) a procedure for equitable stumpage (royalty) calculation is detailed, with appendices showing, *inter alia*, methods used in Burma, Kenya, New Zealand, Queensland and the U.S.A. Under (cii) various proposals are examined in a problem that really concerns the federal *vis-à-vis* the local governments. Under (d) the appointment of a forest economist is recommended.

3508. SIME, J. R. The valuation of immature plantations. *J. S. Afr. For. Ass.* No. 35, 1960 (20-6). 9 refs.

Data are tabulated for valuing 3000 acres of *Pinus patula* in the E. Transvaal. The basis advocated is the "highest rate of interest earned". Accumulated costs and revenue balance at 20 years. The highest rate is found to be 8%. Tables include for 6-, 14-, 20-, 25- and 30-year stands, intermediate and final yields, log prices, revenue per acre (clear felled and thinned), and accumulated costs and revenue at 8%.

3509. KULCSÁR, V. Az erdőállomány értéke megállapításának módszerei szocialista gazdasági viszonyok között. [Forest valuation methods under a socialist economy.] *Erdő* 9 (5), 1960 (175-82 + smries. in suppl.). [Hu.russ.g.]

The author examines capitalist methods in order to find one suitable for socialist conditions, and concludes that the summation of expenditure over the stand's whole life does not provide a suitable approach. For younger stands, methods based on exploitation values are also inapplicable. Before the intersection of the cost and exploitation-value curves, valuation on costs, and after their intersection, valuation on exploitation values, is correct. Establishment costs must be discounted to the present, and existing differences in timber prices taken into account for exploitation values.

3510. KALLIO, K. Eräs metsän tuottoarvon määrittämistapa. [Determining the rental value of a forest.] *Metsät. Aikak.* 1960 (12), (435-6, 453). 8 refs. [F.i.e.]

Tabulated figures, discounted to the present time and for different assortments, with N. and S. Finland treated separately, are given for permissible cut on different medium site types. The rental value is obtained by deducting the capital value of annual administration and tending costs from the total obtained by applying the relevant stumpage values to all assortments for a given site type. Correction figures are given for use with different volumes of growing stock and vigour classes. [Cf. *F.A.* 21 No. 3604.]

3511. HOLLAND, I. I. A suggested technique for estimating the future price of Eastern White Pine stumpage. *For. Sci.* 6 (4), 1960 (369-96). 16 refs.

In this detailed examination an estimate was made in constant dollars of the future wholesale lumber price index of the Bureau of Labor Statistics (BLS). From this value the future prices of the several White Pine lumbers were estimated in constant dollars, using projected ratios of White Pine lumber prices to the BLS lumber price. Future stumpage prices were derived from lumber prices by applying projected ratios of stumpage prices to lumber prices. By this method stumpage prices for Sugar Pine, Western White Pine, and high-, medium-, and low-quality Eastern White Pine will by the year 2010 be respectively \$60, 65, 75, 60 and 45 per 1000 bd. ft. in terms of 1947-49 dollars.

3512. FONDEUR, D. Indemnisation de la traversée des forêts par des lignes électriques. [Indemnification for the crossing of forests by electric transmission lines.] *Rev. for. franç.* 13 (1), 1961 (1-10). 10 refs. [F.]

Illustrates by actual examples the calculation of (1) indemnity for premature felling of timber (a once-for-all payment), (2) indemnity for loss of forest revenue (an annual payment), and (3) indemnity for general inconvenience (also an annual payment).

66. Costing of Logging Operations

See also Nos. 3146, 3157, 3164, 3168, 3191, 3202.

3513. PRYCE, J. M. Cost calculation in logging-tractor machine rates. *Logging Ser. Util. Div. For. Dep. Tanganyika* No. 1, 1957. pp. 5. 1 ref.

A note based on D. M. Mathews' "Cost control in the logging industry" with a calculation worked out on the departmental Unipower tractor.

67. Assessment of Financial Results: Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also No. 3507.

3514. MUTCH, W. E. S. Financial and cost accounting for forest enterprises. *Bull. For. Dep. Univ. Edinb.* No. 7, 1960. pp. 39. 8 refs. Price 7s. 6d.

The intention in this bulletin is first to set out the basic steps in keeping the finance books of an enterprise, with forestry examples, and then to describe the system of recording and costing of forestry work on a particular estate in Scotland. An underlying principle in the development has been that the cost-accounting system should be operable on this small forest estate and capable of ready expansion to suit larger enterprises. It has been found essential to recognize that, while some operations are carried out on a compartment scale and are best related to area, the costs of others are best related to the individual tree or some other base.

3515. Innstilling fra Norsk Forstmannsforeningens investeringskomite. [Report by the investment committee set up by the Norsk Forstmannsforening.] *Tidsskr. Skogbr.* 68 (3), 1960 (108-64). [Nor.]

[Cf. *F.A.* 22 No. 932.] Makes recommendations on amounts to be invested in Norwegian forestry in 1960-70 and discusses separately investments for establishing a technical basis (e.g. surveys and working plans in forestry, aerial photography, research, mapping), for primary production (regeneration, draining and the use of fertilizers, tending), secondary production (transport, machines and tools), and other purposes (e.g. buildings, transport of workers).

3516. SEIP, H. K., FODNÆSS, K., and NERSTEN, S. Investeringskalkyler i skogbruket under forutsetning av jevn avkastning. [Calculating investments in forestry presupposing a constant yield.] *Tidsskr. Skogbr.* 68 (3), 1960 (165-201). [Nor.] (A shorter version by S. Nersten also appears in *Norsk Skogbr.* 16 (10), 1960 (357-8, 361).)

Presents a formula for determining optimum investments in primary or secondary production (planting, or road-building etc., respectively) when the aims are a constant yield over several 10-year periods and a maximum capital value. The various terms of the formula (annual cut in cu. m., net price for that cut in kr./cu. m., present values of future cultivation costs, of future investments in secondary production, and of future general costs, rate of interest, and expectation value of the area used for e.g. roads, log dumps) are defined. An example calculated for Telemark county is given.

68. Administration and Organization of Forest Enterprises

3517. Studiekringdag 1960. Organisatiestructuren in de bosbedrijven. [Study circle 1960. Organization and planning in forestry.] *Ned. Bosb. Tijdschr.* 32 (12), 1960 (433-74). [Du.]

Shortened versions of papers on various aspects of organization and planning in forestry in the Netherlands by P. Verburg, M. Bol, J. T. Overbeek and R. A. van Wel, with a summing up by A. G. Gerritsen.

7. MARKETING, ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

71. Marketing of Forest Products: General

See also Nos. 3684, 3688, 3700, 3952.

3519. PERRY, R. Bird's eye view of [U.K.] timber industry. *Timb. Tr. J.* 236 (4405), 1961 (65-8).

A review by the Chairman, Timber Development Association, covering turnover, major consumers' consumption, research facilities, packaging problems, size of trade unit, imports and home production, woodworking and other consuming industries, employment trends, exports, profitability, future prospects and likely trends in building, packaging, furniture, joinery, timber engineering, and mining.

3520. NORTON, N. A., et al. Marketing forest products from small woodland areas in the Northeast. II. Buying practices of primary wood-using industries and other first handlers of rough forest products. III. Use of marketing assistance and information by forest products buyers and sellers. *Bull. Pa. Agric. Exp. Sta.* No. 670, 1960. pp. 53. [Cf. *F.A.* 18 No. 4487.]

3521. SKOK, R. A. Market practices and price formation for farm woodland products sales in northern and southern Minnesota. *Abstr. of thesis*, in *Dissert. Abstr.* 21 (4), 1960 (718-9). O.R.S.

Studies the marketing system of the two areas, concluding that adjustments may reduce existing inequities but are unlikely, alone, to lead to significant increases in investment.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 3526, 3528, 3683-6, 3688, 3936, 3961.

3522. PRINGLE, S. L., and ARNOLD, J. E. M. Report to the East African High Commission on present wood consumption and future requirements in Uganda. Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1287, 1960. pp. 90 + 5 gphs., 1 map.

3523. SCOTT, C. W. Informe al gobierno de Bolivia sobre producción y clasificación de la caoba y otras maderas para la exportación. [Report to the Government of Bolivia on the production and grading of Mahogany and other export timbers.] Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1241, 1960. pp. 37 + 1 sketch-map. [Span.] Limited distribution.

687. Planning and Organization of the Transport of Men, Supplies and Equipment

3518. BATIAS, A. L'hélicoptère auxiliaire du reboiseur de montagne. [The helicopter as auxiliary to the mountain afforester.] *Rev. for. franç.* 13 (1), 1961 (25-30). [F.]

Describes operations for afforesting abandoned alpine pastures in Savoy, where the expense of making a "jeepable" access road was too high to make motor transport practicable, and planting stock and fertilizers were therefore transported to the planting site by helicopter.

Includes also recommendations on the development of river and rail facilities.

73. Prices

See also No. 3511.

3524. STREYFFERT, T. Utvecklingstendenser beträffande rotvärden och priser på skogprodukter. [Price trends of stumpage and forest products in Sweden.] *Skr. K. Skogshögsk.*, *Stockh.* No. 33, 1960. pp. 181. [Sw.sw.e.e.]

Presents and discusses figures showing fluctuations and trends in prices over the last 50 years.

74. Trade Policy

See Nos. 3217, 3959.

75. Trade Customs and Usages

3525. NORDQUIST, M. Om virkesmättningsmonopolet och virkesmättningslagstiftningen. [The timber measurement monopoly and legislation relating to timber measurement.] *Norrlands SkogsvFörb. Tidskr.* 1960 (4), (359-88). [Sw.]

Discusses Swedish legislation of 1935, 1943 and 1947, and compares conditions in Sweden with those in Finland and Norway.

79. Economics of the Forest Products Industries

See also Nos. 3519, 3700, 3825, 3867, 3941.

3526. KUDERA, J. Korišćenje drvnih masa u industriji celuloze i papira. [Wood consumption in the pulp and paper industry.] *Topola, Beograd* No. 15, 1960 (5-9). [Serb.f.]

Gives figures to show that supplies of raw materials in Yugoslavia exceed present pulp and paper mill capacity, so that much pulpwood must be exported. The expansion of mill capacity will allow end products to be manufactured locally, and reduce exports, with economic benefit to Yugoslavia.

3527. TOMAR, M. S. Supply of Bamboos to the Nepa mills, Nepanagar. *Indian For.* 86 (12), 1960 (748-50). 1 ref.

Bamboo-bearing areas of the Teak forests of Bori range of Hoshangabad division (Madhya Pradesh) form an important source of supply of Bamboos to the Nepa paper mills. Economics and methods of exploitation are discussed on the basis of data collected in 1957.

8. FOREST PRODUCTS AND THEIR UTILIZATION

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 2963, 2968, 3705, 3936.

3528. **Parana Pine—its supply, manufacture and use.** *Res. Note West. Pine Ass. No. 1.* 1311, 1951 (rev. 1959). pp. 3. 3 refs.

A brief review of information on imports, wood properties, seasoning, manufacture, and marketing of *Araucaria angustifolia*.

3529. [Outline of important foreign woods: *Larix gmelinii* Ledebour.] *Suppl. to Wood Ind., Tokyo* 16 (3), 1961. pp. 4. 18 refs. [Jap.] P.R.

Includes photomicrographs of the wood and tabulated data on physical and mechanical properties.

3530. Bois tropicaux. [Tropical timbers.] *Publ. Centre Tech. For. Trop.* No. 12, 1960. pp. 94 + map. [F.]

Includes advice on storage, seasoning and painting, recommendations of species for particular uses, and notes on provenance, nomenclature and wood properties of 47 species from French tropical dominions.

3531. REHMAN, M. A. Decorative and ornamental timbers of India. *J. Timb. Dryers' Pres. Ass. India* 6 (1), 1960 (14-6). P.R.

Briefly describes the appearance and working properties of various Indian timbers used for decorative and ornamental purposes.

3532. The properties and suggested uses for some West African timbers—part 2. *UACO Timber Review, London* No. 2, [1961?] ([10]–[11]).

Presents in tabular form data on physical, mechanical, and working properties and suitability for various uses (joinery, domestic and commercial uses, plywood, structural work, boat-building, transport) of 19 species.

3533. KRYN, J. M., and FOBES, E. W. The woods of Liberia. *Rep. U.S. For. Prod. Lab., Madison* No. 2159, 1959. pp. 147 + 11 tpls., 3 photos, 1 gph., 3 maps. 35 refs. P.R.

A compilation of data from all available sources, the report describes some 364 hardwood species alphabetically by genus, listing common names (where they exist) followed by the family name. All species collected in Liberia are included, together with some, from adjacent areas, that are probably in Liberia but not yet reported.

3534. MONTEIRO, R. F. ROMERO; FRADE, E. CARITA. Essências florestais de Angola. Estudo das suas madeiras. I. Região dos Dembos. Ecologia e anatomia. Ensaios físicos. [Forest species of Angola. Study of their timbers. I. Region of the Dembos. Ecology and anatomy. Tests of physical properties.] *Memórias e Trabalhos, Instituto de Investigação Científica de Angola, Luanda* No. 1, 1960. pp. 135 + 41 plates. 60 refs. [Port.port.f.e.]

Presents data on: (1) the ecology of the region and

the anatomy of the wood of *Bosqueia angolensis*, *Chlorophora excelsa*, *Lannea welwitschii*, *Pseudospondias microcarpa*, *Celtis zenkeri*, *Diospyros mespiliformis*, *Khaya anthotheca*, *Melia bombolo*, *Musanga cecropioides*, *Pteleopsis diptera*, *Pterocarpus tinctorius*, and *Sterculia purpurea*; and (2) the physical properties of the last 8 species.

3535. World timbers. 4-7. *Suppls. to Wood* 25 (12), 1960; 26 (1-3), 1961. Each pp. 2.

African Mahogany (*Khaya ivorensis*); Zebrano (*Brachystegia fleuryana*); Macassar Ebony (*Diospyros celebica*); and Bubinga (*Guibourtia* spp.).

3536. LAMB, G. N. Foreign woods: Blush Tulip Oak, *Tarrietia actinophylla*; African Satinwood, *Fagora macrophylla*. *Wood, Chicago* 65 (11), 1960 (22). P.R.

3537. Timbers of Tanganyika. *Diospyros abyssinica*. Utilisation Division, Forest Department, Moshi, Tanganyika. 1960. pp. 6. 1 ref.

Covers habit, strength properties, anatomy, sawing and woodworking, seasoning, durability and preservation, and uses.

3538. Timbers of Tanganyika, *Cephalosphaera usambarensis* (Tambara). Utilisation Division, Tanganyika Forest Department, Moshi. 1960. pp. 7.

Covers nomenclature, habit, occurrence and distribution, sawlog quality, anatomical structure, physical and mechanical properties, sawing, woodworking, peeling, seasoning, durability and preservation. Of even texture, strong and suitable for kiln-drying and pressure-treatment, Tambara is one of the most useful all-purpose timbers of Tanganyika.

3539. Timbers of Tanganyika. *Cassipourea malosana* (Pillarwood) Utilisation Division, Forest Department, Moshi, Tanganyika. 1960. pp. 9. 9 refs.

Covers habit, sawlog quality, strength properties, anatomy, sawing and woodworking, peeling, seasoning, durability and preservation, and uses.

3540. ARKWRIGHT, P. Know your timber, No. 81. East India Satinwood [*Chloroxylon swietenia*]. *Woodwkg. Ind.* 18 (1), 1961 (39). P.R.

3541. SEABRA, L. DE, and FERREIRINHA, M. P. Contribution à l'étude technologique des *Eucalyptus* cultivés au Portugal. [Contribution to the technological study of Eucalypts in Portugal.] *Estud. Inform. Serv. Flor. Açúic. Portugal* No. 136-E3, 1960. pp. 33. [F.]

Presents data on the anatomical characters, physical, chemical and pulping properties of the wood, pulp properties, essential oils, and bark extracts of 32 *Eucalyptus* spp.

3542. SCHNIEWIND, A. P. The strength and related properties of Pacific Madrone [*Arbutus menziesii*]. II. Shrinkage and strength properties

in the air-dry condition. *Calif. For. & For. Prod. Calif. For. Prod. Lab. No. 20, 1960.* pp. 4. 9 refs. [Cf. *F.A.* 19 No. 3373.]

3543. SCHNIEWIND, A. P. The strength and related properties of California Black Oak [*Quercus kelloggii*]. II. Shrinkage and strength properties in the air-dry condition. *Calif. For. & For. Prod. Calif. For. Prod. Lab. No. 21, 1960.* pp. 3. 5 refs. [Cf. *F.A.* 20 No. 992.]

3544. SCHNIEWIND, A. P. The strength and related properties of Tanoak [*Lithocarpus densiflorus*]: II. Shrinkage and strength in air-dry condition. *Calif. For. & For. Prod. Calif. For. Prod. Lab. No. 22, 1960.* pp. 4. 7 refs. [Cf. *F.A.* 20 No. 3694.]

811. Structure, Identification

See also No. 3957.

3545. MESSERI, A., and SCARAMUZZI, G. Glossario internazionale dei termini usati in anatomia del legno. (Versione italiana). [International glossary of terms used in wood anatomy. (Italian version).] *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (165–209). [It.]

Contains: (1) the list of terms in English with Italian equivalents, (2) a literal translation of the English definitions into Italian. [Cf. *F.A.* 19 No. 2243.]

3546. POWNEY, T. J. Technical note. A model to illustrate the structure of a hardwood. *J. Inst. Wood Sci.* No. 6, 1960 (55).

Describes a 9 × 8 × 11-in. wooden model designed by the author on the same lines as an earlier model for softwoods [see *F.A.* 20 No. 5088].

3547. GHOSH, S. S. Some common cases of confusion among Indian timbers. *Repr. from Timber Trade Journal, Calcutta* 1958 (41–8).

Illustrated by 24 photomicrographs.

3548. MAINIERI, C. Estudo macro e microscópico de madeiras conhecidas por Pau Brasil. [Macro- and microscopic study of timbers known under the name of "Pau Brasil".] *Publ. Inst. Pesqu. tec. S. Paulo* No. 612, 1960. pp. 62. 20 refs. [Port.]

The name "Pau Brasil" is applied to a considerable number of species, apart from the genuine *Caesalpinia echinata*, which is becoming increasingly scarce, and which, because of its red heartwood, has been confused with other species having the same characteristic. For diagnostic purposes, information is given on the general and anatomical characters of the whole group of timbers commonly known as "Pau Brasil", viz. Leguminosae (*Caesalpinia* spp.), Moraceae (*Brosimum* spp.), Rhamnaceae (*Colubrina* spp.), Rubiaceae (*Sickingia* spp.) and Myrtaceae (*Psidium* spp.).

3549. HUDSON, R. H. The anatomy of the genus *Pinus* in relation to its classification. *J. Inst. Wood Sci.* No. 6, 1960 (26–46 + 8 photos). 24 refs.

A microscopic examination has been made of the secondary wood of 73 *Pinus* spp., to see if there is

any correlation between certain gross morphological features (seed-wing type, leaf-fascicle sheath, shape of conelet scale, cone scale) and the wood anatomy. A relationship was found to exist, and as a result the wood anatomy has been used in a revised classification of the genus. Morphologists have in general divided the genus into 6–13 sections contained within the two subgenera *Haploxyylon* and *Diploxyylon*. These groupings are not clear-cut, but on the basis of the present investigation it was found that the genus can readily and conveniently be divided into 5 sections, for which the proposed names (with indication in parenthesis of their relation to the existing classification) are: *Cembra* (*Haploxyylon*), *Paracembra* (*Haplo-Diploxyylon*), *Parapinaster* (*Diplo-Haploxyylon*), *Pinaster-Laricoides* (*Diploxyylon*) and *Pinaster-Taedae* (*Diploxyylon*). Within each section there is a gradual development, from species to species, of the degree of dentation of the ray tracheids, and a parallel gradual development of the features of the cone and/or of the seed-wing. These features seem to remain invariable in spite of changing ecological conditions.

3550. TONO, T., and ONO, K. Studies on Bamboo culm and its fibre as cellulose material. Part 1. Microscopical studies on Bamboo culm and its fibre. *Bulletin, University of Osaka Prefecture, Osaka (Ser. B.)* 10, 1960 (25–32). 8 refs. [E.c.] L.S.

Studies on the anatomy of internodes, nodes, and fibres of *Phyllostachys reticulata*, *P. edulis*, *Pleioblastus simonii*, *Dendrocalamus strictus* and *Melocanna bambusoides* aged 3–4 years, supported by 21 photomicrographs. The individual fibre cells have an almost round or polygonal cross-section, a peculiar structure of 2–4 concentric layers, and many radial cracks projecting from the lumen to the outside of the cell, which are considered to represent pits. Mean fibre lengths varied from 2.2 mm. in *D. strictus* to 1.4 mm. in *P. simonii* and *Phyllostachys edulis*, widths from 22.2 μ in *D. strictus* to 13.4 μ in *P. reticulata*.

3551. CARLQUIST, S. Wood anatomy of Astereae (Compositae). *Trop. Woods* No. 113, 1960 (54–84 + 40 photos). 20 refs.

Tabulates, for 59 species or varieties in 14 genera, qualitative and quantitative data on the wood anatomy of this tribe, and discusses the tendencies and relationships disclosed. Like all the tribes of Compositae studied, it cannot be defined on wood anatomy alone.

3552. SHUTTS, C. F. Wood anatomy of Hernandiaceae and Gyrocarpaceae. *Trop. Woods* No. 113, 1960 (85–123 + 21 photos). 97 refs.

Tabulates from examination of the wood of 18 species of *Gyrocarpus*, *Sparattanthelium*, *Illigera*, and *Hernandia*, their significant anatomical features, and discusses relationships. On the basis of a former study [see *F.A.* 21 No. 4037], the first two genera are placed under Gyrocarpaceae and the last two under Hernandiaceae. Accepting the criteria of anther dehiscence and concomitant xylem characters, two comparatively homogeneous groups are distinguished, viz. (1) Hortonioidae,

Monimioideae, and Hernandiaceae; and (2) the Atherospermoideae, Separunoideae, Gomortegaceae, Gyrocarpaceae, and Lauraceae. Group (1) has longitudinal and (2) valvate anther dehiscence.

3553. MENON, P. K. B. **Anomalous structure of *Gonystylus*.** *J. Inst. Wood Sci.* No. 6, 1960 (47-54). 5 refs.

In a study of the wood of twigs, branches and stem of *G. affinis*, *G. bancanus*, *G. confusus*, *G. forbesii*, *G. maingayi* and *G. velutinus*, the last 3 species, belonging to a distinct subgroup, were found to produce distinctive wood characterized by an anomalous structure consisting of strands of unlignified fibres. In shape the strands are irregular or tangentially extended, with a distinctive optical property contrasting with that of the surrounding normal tissue and giving the wood a patchy appearance in cross-section, similar to that of woods with included phloem. Clearly visible with a hand lens, the tissue is of great diagnostic, and probably taxonomic, significance.

811.1. Anatomical Elements and Tissues

See also Nos. 2777, 2786, 2790, 3599, 3602, 3614, 3752, 3822, 3835, 3843.

3554. BAMBER, R. K., and LANYON, J. W. **Silica deposition in several woods of New South Wales.** *Trop. Forests* No. 113, 1960 (48-53 + 8 photos). 6 refs.

The pattern of SiO_2 deposition in *Syncarpia globulifera*, *Tristania conferta*, *Melaleuca quinquenervia*, *Cryptocarya glaucescens*, *C. corrugata*, *Endiandra pubens*, *Medicosa cunninghamii*, *Pleiococca wilcoxiana*, and *Stenocarpus sinuata* is studied. Silica is not deposited in the ray parenchyma of the outer sapwood (a fact to note where reliance is placed on its presence as a deterrent to marine borers). It first appears, some distance from the cambium and the ray parenchyma, as small particles which coalesce to form a large aggregate in the cell lumen. Some variation in the shape of the aggregate is found in a number of species. The position of SiO_2 is also important when sectioning for diagnostic characters.

3555. GUBA, K. F. **K voprosu ob issledovanii struktury drevesiny rentgenovskim metodom. [Investigation of wood structure by X-rays.]** *Lesn. Zh., Arhangel'sk* 2 (3), 1959 (146-50). 3 refs. [Russ.]

Describes the Debye and Sherrer method of crystal analysis by X-rays, its application to the study of wood structure, and experiments on Walnut, Beech and *Acer pseudoplatanus*.

3556. JAYME, G., and FENGEL, D. **Investigations into the fine structure of bordered pit membranes in Spruce, based on a method of wet preparation.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4908, 1960. pp. 6 + 11 photos. Transl. by G. Urbach from *Holz Roh- u. Werkstoff* 17 (6), 1959 (226-30). Limited distribution. [See F.A. 21 No. 2284.]

3557. BANNAN, M. W. **Ontogenetic trends in conifer cambium with respect to frequency of anticlinal division and cell length.** *Canad. J. Bot.* 38 (5), 1960 (795-802). 29 refs. O.R.S.

Reports the findings of studies on *Thuja occidentalis*, *Pseudotsuga taxifolia*, *Picea* and *Cedrus* spp. Throughout the growth of the first few years, when the perimeter of the stem is expanding fast, the multiplicative pseudo-transverse divisions in fusiform cambial cells occur in relatively rapid sequence, the ratio of survival of newly formed cambial cells is high, and continuous increase in mean cell length ensues. Accommodation of the cambium to circumferential expansion is thus facilitated. With increasing age and diminishing rate of perimeter growth, a decline in all three processes sets in and may continue through to the final growth; more often, however, fluctuations in rate of anticlinal division and cell length occur in middle to late growth, without necessarily any close interrelationship. Sometimes high rates of pseudo-transverse division occur in the late growth, accompanied by only moderate reductions in cell length. *From author's summary.*

3558. HARTLEY, W. R. **Nutrients and tracheid length in seedlings of *Pinus radiata* D. Don.** *Emp. For. Rev.* 39 (4), 1960 (474-82). 32 refs.

Tracheid length was studied in 81 *Pinus radiata* seedlings, as part of an experiment to test the effect on seedling growth of 3 levels of N, P, and K, in a factorial design. All the seed came from one tree. Analyses of variance of length, both near the pith and near the bark, showed that nutrient supply had no significant effect on tracheid length. Differences between seedlings appeared to be genetically controlled, and partly the result of open pollination. This conclusion, and the positive correlation between initial and final tracheid length, confirm the validity of using length in the first ring as an indication of length in the adult wood. No correlation could be demonstrated between final tracheid length and distance from the pith. Pseudo-transverse cambial divisions occurred throughout the ring, and there was no decrease in length at the end of the season or in typical latewood. There was a positive correlation between seedling height and final tracheid length. Tracheids immediately below a leaf trace were shorter than those elsewhere on the same section. *From author's summary.*

3559. **Wood anatomy [: *Pinus caribaea*].** *Extr. from Rep. Qd. For. Serv. 1959/60*, 1960 (44-5).

Pith-to-bark wood samples were taken from the base of five standing 24-year-old stems of *P. caribaea* in Banyabba State Forest, N.S.W. Tracheids showed the usual gymnosperm tendency to increase in length with distance from pith. Most of this increase from initial to final length occurred in about the first 15 years' growth. Trends in tracheid length from pith to bark suggested the possible influence of a "maturity factor". There was no correlation between basic density and tracheid length, but a highly significant correlation between tracheid length and micellar angle. The usual effect of compression wood in reducing tracheid

length and increasing micellar angle was observed, as was its markedly greater effect on micellar angle than on tracheid length, previously noted in Hoop Pine.

3560. BOGDANOV, P. L. Razmery drevesnyh volokon u gibridnyh topolej. [Fibre dimensions of hybrid Poplars.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (29-30). [Russ.]

Presents the results of some measurements on 14 species and hybrids, and points out the excellent properties of *Populus* × 'Leningrad'.

811.2. Special Features and Abnormal Structure

See also Nos. 3553, 3618, 3642, 3836.

3561. BERLYN, G. P. A biometric technique for reaction tissue research. *Proc. Iowa Acad. Sci.* 66, 1959 (98-102). 4 refs. L.S.

Images of sections of tissue taken from the upper side of leaning stems of *Populus deltoides* were projected on to a paper grid system. Specimens were orientated so that the cambium and the last 3 annual rings were included in cross-section. Counts of stimulated and non-stimulated cells in randomly selected grids were recorded. This procedure provides a means of subjecting the incidence of tension wood and other cyto-histological phenomena to statistical analysis. *Author's abstract.*

3562. WESTING, A. H. Changes in radial symmetry in the leaders of Eastern White Pine following inclination. *J. For.* 59 (1), 1961 (17-9). 8 refs.

Plants of *Pinus strobus* were bent over so that leaders were held horizontally for 1-8 weeks. Some of these had 5 mm. of the tip and the leaves of the leader removed. Cross-sections cut 3 cm. above the leader base were photographed and measurements made of the cross-sectional area of compression wood and of U, L, and S, the radial growth on the upper, lower and lateral positions. The radial growth is tabulated as a % of mean S (virtually uninfluenced by bending). In the group with intact leaders U was depressed and L promoted by 2.4 and 4.9% weekly; in the mutilated group these figures were 1.1 and 5.8%. This, and differences in cross-sectional area of compression wood etc., and of posture recovery in the leaders, are discussed in the light of growth-regulating theory. [Cf. *F.A.* 18 No. 871.]

3563. GHOSH, S. S., and PURKAYASTHA, S. K. Anatomical studies on the resiniferous system in *Boswellia serrata* Roxb. trees. *Indian For.* 86 (11), 1960 (684-95 + 20 photos). 23 refs.

Resin canals in *B. serrata* are long tubular structures that ramify both vertically and horizontally in the tree. Although they are present in all parts of the stem, viz. bark, wood and pith, they are most abundant in the bark, where both vertical and horizontal types occur. In the wood only horizontal, and in the pith only vertical, canals are found. In the bark, the vertical canals branch freely and sometimes also anastomose in the parenchymatous regions of the phloem. They are also connected

with the horizontal canals which, again, are continuous from the bark to the wood. These horizontal canals, confined to the rays, are unbranched and mostly appear to end blindly in the wood. A few of them, however, run along the entire radii of the wood, being connected with the vertical canals of the pith. The latter are only short unbranched structures. All these canals originate schizogenously, but branching is accompanied by a certain amount of cell disintegration. Blazing the tree for the gum-oleoresin does not affect the structure of the bark or wood to any great extent, except that the number of horizontal canals increases appreciably in the new tissues formed after tapping, both in the bark and the wood. *From authors' summary.*

811.4. Growth Rings. Early and Late Wood

See Nos. 3478, 3642-3.

811.5. Sapwood and Heartwood

See Nos. 2886, 3786.

811.6. Texture, Grain, Figure

See No. 3812.

811.7. Phloem; Bark

3564. SMITH, L. S. The bark of trees. *Queensland Naturalist, Brisbane* 16 (1/2), 1958 (1-6). L.S.

A lecture, discussing structure and growth, function, types and uses of bark and bark extracts, e.g. bark cloth, cork and fibres, fish poisons, tannins, dyes, gums, resins, latex, food and flavouring, poisons and medicines.

812. Physical and Mechanical Properties

See also Nos. 2886, 3600, 3643.

3565. RAWAT, B. S., and RAWAT, N. S. Physical and mechanical properties of woods tested at the Forest Research Institute, Dehra Dun—Report XI. *Indian For. Rec. (n.s.) Timber Mechanics* 1 (12), 1960 (184-95).

Tabulated data on *Abies pindrow*, *Acacia catechu*, *Buchanania latifolia*, *Cassia fistula*, *Dalbergia sissoo*, *Dipterocarpus indicus*, *Melia azedarach*, *M. indica*, *Morus* spp., *Picea morinda*, *Populus ciliata*, *Prosopis spicigera*, *Shorea robusta*, *Soymida febrifuga*.

3566. MIROŠNIKOV, V. S., and FEDOROV, N. I. Fiziko-mehaničeskie svojstva drevesiny klena BSSR. [Physical and mechanical properties of wood of *Acer platanoides* growing in Belorussia.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (102-8). 5 refs. [Russ.]

Tabulates data on the main properties as determined by tests on samples from 12 specimens of Maple, 120-130 years old, from the *Aceretum querceto-carpineto-oxalidosum* and the *A. q.-c.-caricosum*. Differences in wood properties between the two sites lay within the range of experimental error, and there was considerable uniformity in properties throughout the stem. Information is given on the assortments obtainable from the stems.

3567. HORVAT, I. Prilog poznavanju nekih fizičkih i mehaničkih svojstava crne johovine (*Alnus glutinosa* Gaertn.). [Physical and mechanical properties of *A. glutinosa*.] *Šum. List* 84 (9/10), 1960 (273-89). 9 refs. [Croat.e.e.]

Various wood properties were tested in a total of 1022 samples from bolts cut at breast height from 10 trees in Lipovljani forest district. The trees were 72-91 years old, with a d.b.h. of 30-34 cm. Sp. gr. was low at 0.539 g./c.c. (air-dry), 0.509 (oven-dry), and 0.444 (basic, from o.d. wt./max. vol.). Shrinkage was moderate at 3.8% (radial), 8.2 (tangential) and 12.6 (volume). Static bending strength was low at 411 kg./sq. cm., but impact bending strength (0.6 m.kg./sq. cm.), compression || (497 kg./sq. cm.), modulus of elasticity (95,465 kg./sq. cm.) and hardness (442 kg./sq. cm.) were moderate. The values obtained are compared with those for *Populus alba* and *P. nigra* from Lipovljani and with other published figures for *Alnus* spp.

3568. ŠKIRJA, T. M. Fiziko-mehaničke svojstva drvesiny sučev i veršin karpatskoga buka. [Physical and mechanical properties of wood from the branches and tops of Carpathian Beech.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (111-5). 4 refs. [Russ.]

Tabulates data. The physical properties were roughly the same as for stemwood (except for shrinkage), and the mechanical properties were usually better than in stemwood. Irrespective of age or position, branches and tops are quite suitable for use in the furniture industry.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 3746-7, 3749.

3569. LUNDGAARD, H., BOYE, C., and KIERGAARD-HANSEN, P. Brandstabilitet. [Fire stability.] *Træindustrien* 11 (1), 1961 (2-6). 3 refs. [Dan.] P.R.

Presents the results of experiments in which built-up laminated Spruce beams (cross-section 20 × 34 cm.) were exposed on 3 sides in a gas oven for testing combustion for 2 hours. The rate of burning remained constant throughout at 0.50 mm./min. Temperature within the beams rose very slightly for the first 75 min. and then more sharply, but reached only 75° C. by the end of the period. Moisture at a depth of 1-2 cm. below the burnt zone remained fairly constant. Graphs are given showing, for wood of different cross-sections (square; rectangular, where height = 2 × breadth; planks, where height = 4 × breadth), the reduction in strength occurring when the timber is exposed to burning on all 4 sides. These show that breakage can be expected after 20 and 40 min. for 4-in. and 8-in. square timber and after 10 and 20 min. for 4-in. and 8-in. planks.

3570. KEYLWERTH, R., and CHRISTOPH, N. Beitrag zur Untersuchung der thermischen Holzzersetzung mittels Differential-Thermo-Analysis. [The study of thermal decomposition of wood by differential thermal analysis.] *Materialprüfung, Düsseldorf* 2 (8), 1960 (281-8). 5 refs. [G.g.e.f.f.] N.C.L.

Describes exploratory experiments with a method

and apparatus adapted from mineralogy, in which heat reactions and heat production of a test substance are investigated by comparing its "thermogram" with the differential temperature curve of an inert substance under identical conditions of gradual controlled heating. Test runs with Beech showed exothermic reactions between ca. 160° and 640° C., with peaks at 330°, 440° and 560°. Thermograms of Beech cellulose and lignin, compared with charcoal, showed no clear connexions of the peaks with these substances. Comparisons of untreated specimens of Beech and Bongossi [*Lophira alata* s.l.] with specimens treated with a fire retardant on a phosphate basis indicated that the treated woods developed less heat below 300°, though more above 500°. Thermograms of Teak, Poplar, Birch and Larch and tabulated data on these and 5 further species (Oak, Robinia, Musanga, Spruce and Pine) are presented. Total calories/g. generally compared well with known calorific values. The method is considered promising, but further research on the problems of best conduction and diffusion and reactions to heat under various conditions, e.g. *in vacuo*, is thought to be necessary.

3571. ITO, S. [Voltage-current characteristics of *Cryptomeria japonica*] wood saturated with water. I. Measurement of electric potential distribution and outline of partial resistance. II. Effects of the kinds of electrode and the NaCl solution used for soaking the wood on its characteristics. III. Characteristics for several seconds after supplying voltage.] *J. Jap. Wood Res. Soc.* 6 (3), 1960 (109-21). 23 refs. [Jap.jap.e.e.]

3572. ŽESTJANIKOV, V. M., PRUSS-ŽUKOVSKAJA, I. N., and SYRNIKOV, JU. P. Elektroprovodnost' drvesiny berezy obyknovennoj pri otricateľnyh temperaturah i v processe ottaivanija. [Electrical conductivity of *Betula [verrucosa]* at temperatures below zero and during thawing.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (112-6 + 3 gphs.). 3 refs. [Russ.]

Experiments were made to determine the electrical conductivity of frozen and thawing wood, using samples of freshly felled Birch. An equation is developed, permitting corrections to electrical resistance measurements for wood temperature. The specific electrical resistance of Birch || is considerably greater when the wood is frozen, but it is less than that of ice.

3573. UYEMURA, T. Dielectric properties of woods as the indicator of moisture. *Transl. For. Prod. Lab., Can.* No. 136, 1960. pp. 34. Transl. by M. Kono from *Bull. For. Exp. Sta., Meguro, Tokyo* No. 119, 1960 (95-172). Limited distribution. [See F.A. 21 No. 4887.]

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 3542-4, 3573, 3744.

3574. BERGESEV, A. P., FOKINA, A. G., and ŠTOL'C, A. K. K voprosu primeneniia rentgenovskih lučej dlja issledovaniia drvesiny. [The use of

X-rays for investigations on wood.] *Lesn. Ž.*, *Arhangel'sk* 2 (6), 1959 (151-3). [Russ.]

Describes, with details of the experimental set-up, studies on the rapid determination of wood moisture content by means of X-rays. Samples of Birch and Scots Pine were examined with X-rays in the radial direction. Graphs are presented showing the change in X-ray absorption with changing wood m.c., the method is critically discussed, and the need for further improvements and experiments pointed out.

3575. **Rapid method for determining moisture content of lumber.** *Res. Note West. Pine Ass.* No. 4. 413, 1942 (rev. 1960). pp. 4.

Describes and illustrates the so-called "Bidwell-Sterling" method, a method very similar to that already described [see *F.A.* 20 No. 2284] but substituting toluene for xylene. The procedure is also used as a standard test for moisture in paper.

3576. NIKOLOV, S., PETROV, R., and MATEEVA, L. Nomografično opredeljene na vlažnostta na dărvesinata pri izsušavaneto i. [Nomographic determination of wood moisture content during drying.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (383-90). [Bulg.g.]

Describes the construction and use of the two nomograms presented.

3577. KRZYSIK, F., and SOBCZAK, K. Wilgotność drewna w pomieszczeniach ogrzewanych centralnie. [Moisture content of wood in centrally heated rooms.] *Sylvan* 104 (9), 1960 (29-44). 12 refs. [Pol.pol.russ.e.]

Samples of two different sizes of Spruce, Pine heartwood, Beech and Oak heartwood were kept in a room with central heating for ca. 13½ months. Initial m.c. of the smaller samples was 11.2-13.5%, and of the larger ones 10.4-14.7%. Changes in m.c. are graphed in relation to species, sample size, and climate (inside and outside the room). Wood species affected m.c. variation by only 1-2%; sample size had a greater effect, except in Spruce. M.c. fell from ca. 13% in Sept. to a minimum of 5% in Feb. and rose during March and April to 7%; after the central heating was shut off, m.c. rose rapidly in May to 10.5% and then gradually to its maximum, 13%, in Sept. Periods of low outside temperatures corresponded with periods of dry interior climate.

3578. TSOUKIS, G. Untersuchungen über die Schwankungen des Feuchtigkeitsgehaltes von luft-trockenem Holz. [Investigations on the fluctuations of moisture content of air-seasoned wood.] *Holz Roh- u. Werkstoff* 18 (11), 1960 (415-22). 26 refs. [G.e.] P.R.

Full data, based on 3 trees of each species, are given for *Pinus nigra*, *Castanea sativa*, *Fagus sylvatica* and *Quercus sessiliflora* exposed to the atmosphere, but under shelter, in Greece. [See *F.A.* 18 No. 893; 20 No. 986.]

3579. VILLIÈRE, A. L'équilibre hygroscopique des bois au-dessus de 100° C. [The equilibrium moisture content of wood at temperatures above 100° C.] *Holzforschung, Berlin* 14 (5), 1960 (146-50). 8 refs. [F.f.e.g.] P.R.

An empirical formula for determining e.m.c. is proposed. Results obtained with it agree well with values found by experiment [cf. *F.A.* 18 No. 2242].

3580. WONG, C. N., and BURGESS, H. J. A comparison of linear shrinkage data obtained by different methods. *Res. Pamphl. For. Res. Inst., Kepong* No. 29, 1960. pp. 13.

Gives tabulated data on shrinkage from green to air-dry for a large number of species, measured on boards 1½ and ½ in. thick and/or on specimens measuring 1 × 1 × 4 in., and discusses the comparison of the results.

3581. KRPAN, J. Odnos između utezanja i sadržaja vode u drvu. [Relationship between shrinkage and moisture content of wood.] *Glasn. šumske Pokuse* No. 14, 1960 (127-32). 4 refs. [Croat.e.e.]

The relationship between m.c. and radial, tangential, and volume shrinkage was investigated in >200 samples from each of *Fagus sylvatica*, *Quercus robur*, *Abies alba*, and *Picea abies*. Graphs showing the results obtained are presented for each species. [Cf. *F.A.* 16 No. 889; 20 No. 5119.]

3582. **Longitudinal shrinkage of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1093 (rev.) 1960. pp. 10 + 11 photos, 1 drawing, 3 gphs. 13 refs. P.R.

A revised version of the original 1930 report, briefly discussing: the causes of variation in longitudinal shrinkage; the types of wood in which excessive shrinkage occurs, viz. compression and tension wood, abnormally light wood, wood near the pith, wood in fast-growing conifers, early wood, cross-grained wood, and long pieces of wood; and the relation of longitudinal shrinkage to m.c. Literature (mainly U.S.) covering 1931 to 1959 is cited.

3583. WINKEL, L. **Dimensional stability of Western Pine region species.** *Res. Note West. Pine Ass.* No. 1.114, 1954 (rev. 1959). pp. 17. 4 refs.

A summary of information on shrinkage and swelling derived from experiments by the Western Pine Association Laboratory and other research organizations, covering Douglas Fir, Incense Cedar, Larch, Lodgepole Pine, Engelmann Spruce, Western Red Cedar, and White Fir.

3584. HERMANN, A., and RASMUSSEN, C. A. **Dimensional stability report on Ponderosa Pine.** *Res. Note West. Pine Ass.* No. 1.111, 1935 (rev. 1960). pp. 14.

Appeared previously (1935) as Technical Bulletin No. 1 of the Western Pine Association under the title "Shrinkage and swelling of Ponderosa Pine".

3585. STEFANIAK, J., and CHOLECKI, E. [Effect of complete and partial prevention of swelling on the subsequent shrinkage of wood.] *Rocznik Wyższej Szkoły Rolniczej, Poznań* 1, 1958 (123-58). [Pol.?] From *abstr. in Holz Roh- u. Werkstoff* 18 (8), 1960 (322). [G.] P.R.

[Cf. *F.A.* 22 Nos. 991-2.] In experiments on specimens of 8 different species, oven-dry samples were held between clamps set so as to allow 0, 25,

50, 75 and 100% of the previously determined maximum swelling for the species to take place. The clamped samples were then soaked for 72 hours in water at 20° C., carefully oven-dried and the shrinkage measured. This cycle was completed five times for each variable (species, radial and tangential directions, degree of restraint). Results showed a clear and almost linear [direct] relation between the degree of swelling restraint and the degree of shrinkage occurring on subsequent drying.

3586. RACZKOWSKI, J. Anizotropia ciśnienia pęcznienia drewna. [Anisotropy of swelling pressure of wood.] *Folia for. polon. (Drzewn.)* No. 2, 1960 (115-34). 27 refs. [Pol.russ.e.]

Experiments were made, using Ivanov's method of measuring swelling pressure [see *F.A.* 15 No. 4041], on samples of Scots Pine, Beech and Ash. The results, statistically treated, are presented in tables and polar diagrams, and permit the following conclusions: (1) The anisotropy of swelling pressure (a.s.p.) in the plane defined by the tangential and radial directions does not correspond to the anisotropy of free swelling. (2) The a.s.p. approaches the anisotropy of the limit of plastic flow during compression across the grain. (3) The a.s.p. tends to decrease with decreasing differences in the structure of the annual ring, i.e. in passing from conifers to diffuse-porous hardwoods. (4) The a.s.p. is probably conditioned by the non-homogeneous structure of the annual rings and by the influence of the rays.

3587. KONTEK, W., NOWAK, K., and PAPRZYCKI, O. Z badań nad siłą pęcznienia się drewna. [Studies of the warping force of wood.] *Prace Inst. Tech. Drewna* 5 (1), 1958 (46-60). [Pol.pol.russ.e.] P.R.

To study the warping force (w.f.) of Pine and Beech in relation to sample thickness and growth-ring patterns, investigations were made on the hypothesis that the externally applied force necessary to counteract any deformation of a sample with one wetted surface, would determine the w.f. Results showed that: (i) w.f. is dependent on the sample thickness and growth-ring pattern; (ii) w.f. varies directly with thickness; (iii) for samples of equal thickness, greatest w.f. was observed for those with rings tangential to the long face of the sample and least for those with radial rings; (iv) with an increase in thickness of the samples, maximum w.f. was observed at lower mean m.c. *From authors' summary.*

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 2776, 3461, 3599, 3642, 3786.

3588. MOZINA, I. Über den Zusammenhang zwischen Jahrringbreite und Raumdichte bei Douglasienholz. [Relation between annual-ring width and density in Douglas Fir.] *Holz Roh- u. Werkstoff* 18 (11), 1960 (409-13). 22 refs. [G.g.e.] P.R.

Studies were made on 3376 samples from 35 stems taken from Douglas Fir plantations aged 45-70 years, in mixture with native conifers, on 5

plots in Slovenia at 300-800 m. alt. The relationship between annual-ring width and density is plotted in a diagram for all the samples, for individual stems, and for the various dominance classes. Density was influenced only to a small extent by annual-ring width. The relation of density to age, annual-ring width, and distance from pith, was computed by regression, and it was revealed that wood density in Douglas Fir depended more on the location of samples within the log, and on other still unknown factors, than on annual-ring width.

812.7. Strength Properties: General

See also Nos. 3542-4, 3602, 3704, 3707-8, 3743, 3745-6, 3779, 3818, 3847-8.

3589. BOLDENKOV, R. P. K voprosu o temperaturnykh popravkakh dlja predelov pročnosti drevesiny. [The problem of temperature corrections for strength-ranges of wood.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (117-22). 8 refs. [Russ.]

The Soviet Standard covering tests on the mechanical and physical properties of wood allows laboratory testing at any temperature from 15° to 25° C. (35° in southern regions). Experiments were undertaken to work out a method of correcting values for mechanical properties to a standard temperature of 20°. Compression ||, shear ||, and static bending, were investigated on Scots Pine, Oak and Beech (and also on some other species), and the results are shown in graphs and tables for temperatures from 0° to 50° and for various wood densities. Corrections to the strength values per 1° C. of deviation from the standard temperature are presented (some of the values being taken from works by other Russian authors), and it is concluded that, within the range $\pm 5^\circ$ from the standard (20°), temperature corrections are unnecessary.

3590. HUDSON, W. M. The effect of pre-compression on the static and impact bending strength of wood. *Wood* 26 (1), 1961 (18-20). 3 refs.

Specimens of Douglas Fir, Sitka Spruce and Noble Fir were pre-loaded to induce compression stresses, and were then reversed and tested to destruction in static and impact bending. Results show that the reductions in strength in static bending were relatively small compared with those in strength under impact loading. Compression failures, which may not be significant under some conditions, must continue to be of critical importance for the selection of material subjected to other than static loads. *From author's summary.*

3591. ŠUTKA, JA. Ě. Zavisimost' meždu pročnost'ju pri izgibe, širinoj godičnyh sloev i tverdot'ju drevesiny jasenja. [Relation between [static] bending strength, width of annual rings, and [end-grain] hardness of Ash.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (173-5). 6 refs. [Russ.] N.L.L.

Calculations of the relationship showed that the bending strength (in kg./sq. cm.) of Ash from Ash/*Aegopodium podagraria* stands was $898 + 0.42H^2 + 543$, where δ is width of annual ring in mm., and H^2 is end-grain hardness in kg./sq. cm. The

bending strength of Ash from Ash/*Spiraea ulmaria* stands was $91.5 \delta + 0.85H^a + 240$.

3592. KOLLMANN, F. Verformung und Fließen bei Querdruckbelastung von Holzwürfeln. [Deformation and flow in wood cubes under loading perpendicular to the grain.] *Materialprüfung, Düsseldorf* 2 (8), 1960 (289-94). 12 refs. [G.g.e.f.e.f.] N.C.L.

Presents deformation (stress/strain) graphs of 30-mm. cubes of Spruce, Ash, Birch and Beech wood, each sample being tested six times radially and six times tangentially, alternately at m.c. 14-15% and m.c. nil. Each test consisted of 5 stress-release sequences of ca. 1 minute, with maximum stresses ca. $\frac{1}{2}$ of nominal compression strength $\perp$ for the species. The effect of structure (particularly the density difference between early and late wood in conifers and ring-porous hardwoods), direction, and m.c. on plasticity, elasticity and damping (energy loss on deformation) are discussed. Plastic deformation in Spruce of 14-15% m.c. in the radial direction was 2-2.5 times that in the tangential. Rheological models proved suitable for the interpretation of the results.

3593. TILTINŠ, K. K. Novyj metod opredelenija soprotivlenija drevesiny iznosu. [A new method of determining the abrasion resistance of wood.] *Trud. Inst. Lesozhoz. Probl., Riga* No. 18, 1960 (89-98). 7 refs. [Russ.] N.L.L.

Wood samples, sand and an abrasive are placed in a smooth-walled steel drum of regular hexagonal cross-section and 0.19 cu. m. volume, which is rotated about its horizontal axis (there is no shaft through the drum). Experiments have shown the optimum proportions (by volume of the drum) to be: wood samples 10%, river sand 15%, abrasive 1%, so that 100 samples (60-mm. cubes) can be tested at once. The moisture content of the samples, sand, and abrasive should be 10-14%. Test periods can be from 2 to 10 hours, and a drum speed of 25 rev./min. has proved suitable. The pros and cons of the new method are discussed vs. conventional methods.

3594. RASMUSSEN, C. A. Abrasion resistance of the Western Pines. *Res. Note West. Pine Ass.* No. 1.121, 1942 (rev. 1959). pp. 3.

Reports on tests on 17 hardwood and softwood species to determine resistance to abrasion when used for flooring. The western Pines compared well with competitive softwoods. No difference in amount of wear was noted between heartwood and sapwood. Wet wood resisted abrasion about twice as well as the same wood dry.

3595. KELLOGG, R. M. Effect of repeated loading on tensile properties of wood. *For. Prod. J.* 10 (11), 1960 (586-94). 20 refs.

Confirms and amplifies earlier results [cf. *F.A.* 20 No. 3703]. Between the 9 species (conifers and hardwoods) tested, including the initial 3, the differences in creep response related to initial strain, though sometimes significant, were small. Creep-cycle number relationships were adequately described by a power function. Within the conditions of the

test, no appreciable effects on elasticity and ultimate strength were found, but ultimate strain increased. An attempt is made to explain the results in terms of the molecular structure of the cellulose chains.

3596. LEE, I. D. G., and LORD, A. D. Comparative test on the nailing properties of European Redwood and Western Red Cedar. *Test Memor. Timb. Developm. Ass., Lond.* No. E/TM/40, 1960. pp. 17. 4 refs. Price 3s. 6d.

In a comparative test on *Pinus sylvestris* and *Thuja plicata*, the resistance to withdrawal of nails driven at 3 different directions to the grain, and the shear strength of double-lap joints, were greatly improved by using (a) special ringed-shank nails vs. (b) standard wire nails. Used with both nails, *P. sylvestris* proved the more reliable, probably owing to its higher sp. gr. and cleavage strength, but *T. plicata* used with (a) gave better results than *P. sylvestris* used with (b). From the standard deviation values tabulated, *T. plicata* appeared, in general, to be the more variable timber.

3597. REID, J. S., and HELLAWELL, C. R. Note on tests of nail holding in Rimu and Radiata Pine and practical implications. *Inter. Res. Release (For. Prod.) For. Res. Inst. N.Z. For. Serv.* No. 14, 1960. pp. 3.

Tests confirmed the very high nail-holding power of Rimu (*Dacrydium cupressinum*). Tests with Radiata Pine showed that this timber, though inferior to Rimu in this respect, is comparable with many softwoods used in other countries for house construction.

812.8. Workability. Working Properties

3598. NARAYANAMURTI, D., PRASAD, B. N., and SINGH, K. Surface smoothness measurements of wood. *Comp. Wood* 6 (3), 1959 (21-4). 3 refs. P.R.

Presents tabulated results of tests in which the surface smoothness of planed and sanded specimens of 41 timber species was measured by a method similar in principle to that previously used to measure the permeability of wood etc. [see *F.A.* 5 p. 182, D. Narayanamurti and A. Purushotham]. Very smooth surfaces were obtained with *Diospyros* sp., *Calophyllum* sp., *Cupressus torulosa* and *Lagerstroemia* sp., and rough surfaces with *Holoptelea integrifolia*, *Dalbergia latifolia*, *Terminalia paniculata*, *Spondias mangifera* and *Dipterocarpus* sp. Little difference in smoothness resulted from lathe speeds of 588, 1032 and 1799 rev./min. save that *Diospyros ebenum*, *Pterocarpus dalbergioides*, *Terminalia bialata* and *Dichopsis elliptica* gave smoother surfaces at the higher speeds.

813. Wood Chemistry

See also Nos. 2740-1, 3643, 3759, 3819 *et seq.*

3599. CHUTORSCHIKOW [HUTORŠČIKOV], I. S. [The physical properties and chemical composition of the wood of *Larix sibirica*.] *Bumažnaja Promyšlennost', Moskva* 34 (10), 1959 (9-10). [Russ.] From *abstr. in Holzforschung, Berlin* 14 (5), 1960 (158). [G.] P.R.

[Cf. F.A. 15 No. 639.] The wood was very variable, both within and between stems, e.g. with a mean ring width of 1.06 mm., density ranged from 0.530 to 0.826 g./c.c. Heartwood formed 70.6% of the stem. Mean values of the wood constituents were: pure cellulose 44.01%; pentosans 3.95%; lignin 26.51%; pentosans with methyl-pentosans 8.28%; and ash 0.25%. For pulping, material containing much heartwood is unsuitable, because the heartwood contains only 43.48% cellulose as against 52.60 in the sapwood.

3600. WIĄCKOWSKI, J., and SURMIŃSKI, J. Z badań nad składem chemicznym i niektórymi fizycznymi i mechanicznymi własnościami drewna bożodrzewu. [Investigations on the chemical composition and some physical and mechanical properties of *Ailanthus altissima* wood.] *Sylvan* 104 (9), 1960 (95-9). 12 refs. [Pol.]

A review of world literature [cf. F.A. 17 No. 3228; 18 No. 866; 19 No. 1146].

3601. VINOKUROV, D. M., and HOMENKO, N. I. O himičeskom sostave drevesiny Evropejskogo buka. [Chemical composition of *Fagus sylvatica* wood.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (155-9). 6 refs. [Russ.russ.]

Samples were taken from four trees all ca. 90 years old and of site class Ia, but growing on different aspects and in stands of different density. Results are tabulated showing the % of chemical components (cellulose, lignin, pentosans, extracts in hot water and in organic solvents, minerals, methoxyls) for the butt, mid and top parts of the stem at central, mid, and peripheral points, for each tree. Aspect and stand density caused definite differences in chemical composition.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 2741, 2743, 3719, 3886.

3602. KLAUDITZ, W. The biological-mechanical effect of the acetyl groups in the mechanical tissue in hard woods. *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4907, 1960. pp. 21 + 4 photos. Transl. by B. Robertson from *Holzforschung, Berlin* 11 (2), 1957 (47-55). Limited distribution. [See F.A. 19 No. 2316.]

3603. BABICKI, R. Zawartość celulozy i ligniny w drewnie $\times$ *Populus marilandica*. [The cellulose and lignin contents of *P. $\times$ marilandica* wood.] *Sylvan* 104 (9), 1960 (100-6). 5 refs. [Pol.]

Using samples taken at heights of 0.3, 4 and 8 m. from the four cardinal points round two 24-year-old trees growing on the same site, cellulose and lignin contents were determined (Kürschner-Hoffer method, and 72% H_2SO_4 respectively). Results are tabulated and graphed. Differences between the trees were not great. The cellulose content in both was lowest at 4 m., and was higher at 8 than at 0.3 m. Lignin content tended to be highest at 4 m. The highest cellulose content was in wood 15-18 years old.

3604. RUCH, F., and HENGARTNER, H. Quantitative Bestimmung der Ligninverteilung in der

pflanzlichen Zellwand. [Quantitative determination of the lignin distribution in the cell-wall of the plant.] *Beih. Z. Schweiz. Forstver.* No. 30, 1960 (75-90 + 5 photos). 11 refs. [G.g.]

A study on jute fibres, using the fluorescence of lignin to determine its distribution, with results corresponding well to those obtained by ultra-violet absorption techniques.

3605. Stroenie lignina i ego obrazovanie. [Lignin structure and formation.] *Trud. Inst. Lesozhoz. Probl., Riga* No. 19, 1960 (4-144). Many refs. [Russ.] N.L.L.

Fifteen papers presented at a conference in Oct. 1958 at Riga, including: Biosynthesis and breakdown of lignin (S. M. Manskaja and L. A. Kodina); Lignin biochemistry (M. S. Bardinskaja); The conversion of pentosans in the shoots of *Populus trichocarpa* (Z. N. Krejberg, V. N. Sergeeva and Ja. K. Grabovskij); The presence of lignin precursors in a group of wood extracts (L. N. Mozejko and V. N. Sergeeva); The participation of lignin in natural processes (T. V. Drozdova); The problem of lignin structure (A. F. Semečkina and N. N. Šorygina); The nature and properties of low-molecular Birch lignin (I. I. Bejnart); Reactive groups in lignin, and lignin inactivation (M. N. Cypkina and M. N. Atapina); The composition of organo-soluble lignin (D. V. Širjaev); Study on the composition and certain properties of hardwood lignin (V. S. Gromov); The change in certain functional lignin groups in relation to the depth of lignification, and methods of determining them (L. N. Mozejko, V. N. Sergeeva and V. R. Jaunzems).

3606. KRATZL, K., and FAIGLE, H. Die Biogenese der Phenylpropan-Einheit des Fichtenlignins. [The biogenesis of the phenylpropane structural unit of Spruce lignin.] *Zeitschrift für Naturwissenschaften, Tübingen* 15b (1), 1960 (4-11). 28 refs. [G.g.] L.S.

When *d*-glucose, labelled with C^{14} , was introduced into a Spruce twig by infusion, ca. 2% of the radioactivity utilized was probably fairly evenly distributed over the lignin and other wood components. The distribution of radioactivity in the vanillin molecule was in accordance with the schema for the biosynthesis of phenyl propane units based on B. D. Davis's findings with micro-organisms. Similar experiments with Na acetate indicated that its acetyl component was utilized far less than glucose in lignin formation. [Cf. F.A. 21 No. 3700; 22 No. 1012.]

3607. NAKANO, J., ISHIZU, A., and MIGITA, N. Studies on lignin. XXXII. Ester groups of lignin. *Tappi* 44 (1), 1961 (30-2). 7 refs. P.R.

Studies the distribution of *p*-hydroxybenzoate groups in the tree stem, and the site of ester linkage in *Populus nigra* and *P. maximowiczii*, which contain large amounts of these groups. These amounts are roughly equal (a) for samples taken at the same height and from the same annual ring, (b) for both sapwood and heartwood, and (c) for each sample obtained from the same annual ring at various heights. As a result of periodate oxidation and hydrogenolysis of *P. maximowiczii* "native lignin", it is concluded

that at least a part of the *p*-hydroxybenzoate groups are located at the α -position of the lignin side-chain. *From authors' summary.*

3608. TIŠČENKO, D. Kislotsnaja kondensacija lignina. [Acid condensation of lignin.] *Ž. prikl. Him.* 32 (1), 1959 (157-66). 33 refs. [Russ.] P.O.

Describes the process of lignin condensation or "inactivation" and outlines its theoretical and practical importance in the production of cellulose from wood that cannot be cooked by the sulphite process at the normal rate if it has been pretreated with hot water or solutions of acids or alkalis, or if phenols, especially polyhydric, enter the cooking liquor from the bark, e.g. particularly in the case of unbarked, floated Spruce and Douglas Fir.

3609. PEARL, I. A., and BUSCHE, L. R. Studies on the chemistry of Aspenwood. XI. The Klason lignin determination as applied to Aspenwood with special reference to acid-soluble lignin. *Tappi* 43 (12), 1960 (961-70). 47 refs. P.R.

[Cf. F.A. 18 No. 3324.] In an investigation of the solubilization of *Populus tremuloides* lignin by the Klason procedure of lignin determination (methods described), ultraviolet spectrophotometry indicated that at least 80% of the acid-soluble lignin was not altered severely. Chromatographic studies demonstrated that syringic, vanillic, and *p*-hydroxybenzoic acids are split from the lignin during the Klason procedure, and that *p*-hydroxybenzoic acid represents a significant part of both the acid-soluble lignin and the Klason lignin.

3610. PEARL, I. A., and BUSCHE, L. R. Studies on the chemistry of Aspenwood [*Populus tremuloides*]. XII. Studies on the preparation of milled wood lignin from Quaking Aspenwood. *Tappi* 43 (12), 1960 (970-4). 19 refs. P.R.

Describes the method of preparing milled wood lignin, using a vibratory ball mill specially constructed for sub-zero grinding temperatures, and presents the data obtained from fractions (isolated at $-78^{\circ}\text{C}.$) examined on the basis of chemical analyses and ultraviolet and infra-red spectra. *From authors' summary.*

3611. FREUDENBERG, K., and CHEN, C.-L. Methylierte Phenolcarbonsäuren aus Lignin. [Methylated phenolcarboxylic acids from lignin.] *Chem. Ber.* 93 (11), 1960 (2533-9). 15 refs. [G.g.] P.R.

A re-investigation in connexion with isotope studies [cf. F.A. 21 No. 981] of the breakdown of lignin from methylated Spruce wood-flour by a previously published method, resulting in the identification of several new acids.

3612. POLJAK, A. B. Metodika prigotovljenja celjuloznih voloknistih materialov dlja issledovanija v infrakrasnom svete. [Method of preparing cellulose fibrous materials for investigation in infra-red light.] *Lesn. ž.* Arhangel'sk 3 (1), 1960 (152-4). 3 refs. [Russ.russ.]

The fibre is ground into a powder and mixed with powdered KBr.

3613. STEPANOV, B. I., et al. O svjazi celljulozy so sputnikami v rastitel'noj tkani. [The bond between cellulose and associated substances in plant tissues.] *Dokl. Akad. Nauk SSSR* 135 (3), 1960 (624-6). 8 refs. [Russ.] A.P.B.

Scots Pine wood of various ages—from young shoots to wood of interglacial age (from a bog)—linen waste, and cotton cellulose, were cooked with NaOD in heavy water. Isotope analysis of distillates from the spent liquors, and infra-red spectroscopy of the celluloses obtained, suggest that in the wood cellulose a chemical bond exists between the cellulose and associated substances at the sixth C atom of some of the elementary chains of the macromolecule, but that the bulk of the OH groups do not show such bonding.

3614. LIANG, C. Y., et al. Infrared spectra of crystalline polysaccharides. VII. Thin wood sections. *Tappi* 43 (12), 1960 (1017-24). 10 refs. P.R.

[Cf. F.A. 11 No. 1876.] Records the infra-red spectra of wood sections both in the untreated state and after treatment for removal of lignin and hemicellulose. Differences between the spectra of hardwood (*Acer rubrum*) and softwood (*Pseudotsuga taxifolia*, *Tsuga heterophylla*, *Picea sitchensis*, *Thuja plicata*) sections were correlated with the greater glucomannan and smaller 4-O-methylglucuronacetylxytan content of the latter. Differences in the spectra of cross vs. radial sections for a given species can be explained mainly in terms of fibril orientation, and by comparing the spectra of wood sections with those of pure cellulose, Klason lignin, 4-O-methylglucuronacetylxytan and mannan, a complete assignment of all the bands in the spectrum of wood was made. Polarization measurements on radial sections indicated that, in addition to the cellulose, the xylan and mannan components are oriented in the wood. *From authors' summary.*

3615. ADAMS, G. A. Constitution of an acidic xylan from Tamarack (*Larix laricina*). *Canad. J. Chem.* 38 (12), 1960 (2402-9). 27 refs. O.R.S.

An acidic xylan isolated from the wood contained arabinose, xylose and uronic acid (1:17:3) and was homogeneous on examination by electrophoresis and sedimentation. Its properties and constitution are discussed.

3616. BOUVENG, H. O. Studies on arabogalactans. III. Degradation products of arabogalactan A from *Larix occidentalis* Nutt. and an electrophoretic examination of arabogalactans from other *Larix* species. IV. A methylation study of arabogalactan B from *Larix occidentalis* Nutt. *Acta chem. scand.* 13 (9), 1959 (1869-83). 25 refs. [E.e.] O.R.S. [Cf. F.A. 20 No. 5154.]

3617. TIMELL, T. E. Isolation of galactoglucmannans from the wood of gymnosperms. *Tappi* 44 (2), 1961 (88-96). 56 refs. P.R.

Deals largely with the isolation of mannose-containing hemicelluloses from *Tsuga canadensis*, galactoglucmannans also being isolated from *Abies amabilis*, *Picea engelmannii*, *Pinus strobus*, *Thuja occidentalis* and *Ginkgo biloba*.

3618. BOUVENG, H. O., and MEIER, H. Studies on a galactan from Norwegian Spruce compression wood (*Picea abies* Karst.). *Acta chem. scand.* 13 (9), 1959 (1884-9). 19 refs. [E.e.] O.R.S.

3619. JABBAR MIAN, A., and TIMELL, T. E. Studies on *Ginkgo biloba* L. 3. Constitution of a glucomannan from the wood. *Svensk PappTidn.* 63 (24), 1960 (884-8). 41 refs. [E.e.sw.g.] P.R.

The characteristics of the glucomannan are discussed. They closely resemble those of 15 glucomannans so far isolated from conifers. [Cf. *F.A.* 22 Nos. 2395, 2398.]

3620. GYAW, M. O., and TIMELL, T. E. Constitution of a glucomannan from the wood of Eastern White Pine (*Pinus strobus* L.). *Canad. J. Chem.* 38 (10), 1960 (1957-66). 50 refs. O.R.S.

In glucomannans isolated by different methods, ratios of mannose to glucose were 3-8 to 1, and 2-7 to 1, respectively. Yields, based on mannose content of the wood, were 70 and 50%. The constituents of the glucomannan are discussed.

3621. JABBAR MIAN, A., and TIMELL, T. E. Isolation and properties of a glucomannan from the wood of Red Maple (*Acer rubrum* L.). *Canad. J. Chem.* 38 (9), 1960 (1511-7). 30 refs. O.R.S.

A glucomannan was isolated from the wood in a yield of 92% of the mannose residues and with a ratio of mannose to glucose of 2 to 1. The constituents of the glucomannan are discussed.

3622. TIMELL, T. E. Isolation and properties of an *O*-acetyl-4-*O*-methylglucurono-xyloglycan from the wood of White Birch (*Betula papyrifera*). *J. Amer. Chem. Soc.* 82 (19), 1960 (5211-5). 52 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives

See also Nos. 2745, 3890.

3623. NICKEL, S. Beitrag zur quantitativen Proteinstickstoff-Bestimmung in Holz. [The quantitative determination of protein N in wood.] *Holz-forschung, Berlin* 14 (5), 1960 (150-2). 19 refs. [G.g.e.] P.R.

A method based on the Kjeldahl principle was developed, and proved suitable even with comparatively small samples. The relative distribution of proteins in a Scots Pine stem 96-100 years old was determined. This ranged from 0-57 to 0-22%, there being a sharp drop from the outermost sapwood to the beginning of the heartwood, and then a small rise from the middle of the heartwood to the pith.

3624. CARLBERG, G. L., and KURTH, E. F. Extractives from the Western true Firs. *Tappi* 43 (12), 1960 (982-8). 23 refs. P.R.

No distinguishing differences were found in the extractives of wood samples of *Abies amabilis*, *A. procera*, *A. concolor* and *A. grandis*, the extractive content being low in each case, with no evidence of the presence of terpenes or flavonoids. Spectral studies indicated that the basic structural unit for all extracts [based on a comparison of alcohol-soluble components, using infrared and ultraviolet

spectra colour reactions and paper chromatography] was the flavan nucleus. *From authors' summary.*

3625. AKIYOSHI, S., ERDTMAN, H., and KUBOTA, T. Chemistry of the natural order of Cupressales. XXVI. The identity of junipene, kuromatsuene and longifolene, and of juniperol, kuromatsuol, macrocarpol and longiborneol. *Tetrahedron, Lond.* 9 (3/4), 1960 (237-9). 12 refs. [E.e.] O.R.S. [Cf. *F.A.* 21 No. 4927.]

3626. ZAVARIN, E., ANDERSON, A. B., and SMITH, R. M. On the occurrence of α -thujaplicinol in the heartwood of *Cupressus pygmaea* (Lemm.) Sarg. *J. organ. Chem.* 26 (1), 1961 (173-6). 17 refs. O.R.S.

A new tropolone (6-isopropyl-7-hydroxytropolone), α -thujaplicinol, and nootkatin were isolated. *From authors' summary.*

3627. ROFF, J. W., and WHITTAKER, E. I. Toxicity tests of a new tropolone, β -thujaplicinol (7-hydroxy-4-isopropyltropolone) occurring in Western Red Cedar [*Thuja plicata*]. *Canad. J. Bot.* 37 (5), 1959 (1132-4). 11 refs. O.R.S.

The toxicity of (a) β -thujaplicinol [cf. *F.A.* 20 No. 1017], (b) γ -thujaplicinol, and (c) PCP (Na salt) were compared against the brown rots *Poria monticola* and *Coniophora puteana*, and the white rots *Polyporus versicolor*, *P. weirii*, and *Stereum sanguinolentum*. Lethal concentrations for brown rots, found by using different concentrations of the toxicants in malt-agar mixtures, were 0-002% for (c), 0-003% for (a) and 0-005% for (b). For white rots, threefold increases of (b) and (c) were required; the least effective was (a), particularly against *P. versicolor*, which was not killed at 0-15%; *P. weirii* was killed at 0-04 and *S. sanguinolentum* at 0-12%. Since the content of (a) in Cedar wood is ca. $\frac{1}{10}$ that of the thujaplicins, its contribution to the durability of *T. plicata* is of minor importance. [Cf. *F.A.* 10 No. 1899; 15 No. 4097.]

3628. GARDNER, J. A. F., MACDONALD, B. F., and MACLEAN, H. The polyoxyphenols of Western Red Cedar (*Thuja plicata* Donn). II. Degradation studies on plicatic acid, a possible lignan acid. *Canad. J. Chem.* 38 (12), 1960 (2387-94). 15 refs. O.R.S.

Plicatic acid [cf. *F.A.* 21 No. 2356] has been further characterized by preparation and analysis of additional crystalline derivatives.

3629. DESALBRES, L. Constituants stéroïdiques et céryliques du pin maritime des Landes. [Steroid and ceryl constituents of *Pinus pinaster* from the Landes.] *Bull. Soc. Chim. France* 1959 (9), (1348-54). 7 refs. [F.f.] O.R.S.

Presents data on the amounts of resin acids, phytosterols, cerotic and lignoceric acids, etc. obtained by extraction of wood from trees of medium age from 3 districts.

3630. HERGERT, H. L. Chemical composition of tannins and polyphenols from conifer wood and bark. *For. Prod. J.* 10 (11), 1960 (610-7). 51 refs.

An analysis of extracts from the wood and bark of 12 species from 10 genera by two-dimensional

paper-chromatography and other methods. Monomeric leucocyanidins and catechins were found in all genera, with highest concentrations near the cambium. Their distribution in the tree, and the properties of the water-soluble polyphenolic polymers (tannins), suggest that the tannins are derived from these monomers; in some genera, e.g. Spruce, substituted stilbenes may also be incorporated. Heartwood colour formation is also thought to be connected with the polymerization (and later oxidation) of these monomers. The composition of tannins actually or potentially useful in commerce (*Larix*, *Picea*, *Tsuga* and *Pseudotsuga taxifolia*) is discussed in greater detail (including literature references), and the taxonomic significance of polyphenols touched on.

3631. CLARK-LEWIS, J. W., KATEKAR, G. F., and MORTIMER, P. I. Flavan derivatives. Part IV. Teracadin, a new leucoanthocyanidin from *Acacia intertexta*. *J. Chem. Soc. Feb.*, 1961 (499-503). 13 refs. O.R.S.

The new leucoanthocyanidin (teracadin) from the heartwood was found to be $(-)-7,8,4'$ -trihydroxy-2,3-*cis*-flavan-3,4-*cis*-diol, an analogue of melacadin. The wood also contained a very small amount of isoteracadin and $(+)$ -pinitol. *From authors' summary.*

3632. AKISANYA, A., *et al.* West African timbers. Part III. Petroleum extracts from the genus *Entandrophragma*. *J. Chem. Soc. Oct.*, 1960 (3827-9). 8 refs. O.R.S.

[*Cf. F.A. 21 No. 2359.*] Heartwood of all 4 species yielded β -sitosterol, the only crystalline substance obtained from *E. candollei*. *E. angolense* also yielded either an unsaturated lactone (gedunin) or a methyl ester (methyl angolensate)—never both in the same sample. *E. cylindricum* yielded a crystalline lactone (entandrophragmin) and *E. utile* entandrophragmin and utilin and, on further extraction with acetone, methyl angolensate.

3633. HOBBS, J. J., and KING, F. E. The chemistry of extractives from hardwoods. Part XXIX. Eusiderin, a possible by-product of lignin synthesis in *Eusideroxylon zwageri*. *J. Chem. Soc. Dec.*, 1960 (4732-8). 5 refs. O.R.S.

Eusiderin is a neutral compound, $C_{22}H_{26}O_6$. It contains a *C*-methyl, an allyl and 4 methoxyl groups and its recognizable degradation products are pyrogallol derivatives.

3634. KING, F. E., and MORGAN, J. W. W. The chemistry of extractives from hardwoods. Part XXX. The constitution of katiconic acid, a triterpene from *Sandoricum indicum*. *J. Chem. Soc. Dec.*, 1960 (4738-47). 12 refs. O.R.S.

Katiconic acid was shown to be 3 α -hydroxyolean-12-en-29-oic acid. A minor extractive, indicic acid, is an ester of katiconic acid. *From authors' summary.*

3635. COVELL, C. J., KING, F. E., and MORGAN, J. W. W. The chemistry of extractives from hardwoods. Part XXXI. 2-Acetyl-1, 8-dihydroxy-3-methylnaphthalene (musizin), a constituent of *Mae-sopsis eminii*. *J. Chem. Soc. Feb.*, 1961 (702-6). 14 refs. O.R.S.

3636. RAMACHANDRA ROW, L., and SUBBA RAO, G. S. R. A new triterpene carboxylic acid from [the wood of] *Terminalia tomentosa* Wight et Arn. *Tetrahedron Letters, London* 1960 (27), (12-6). 10 refs. [E.] O.R.S.

The structure and properties of the new acid, tomentosic acid ($C_{30}H_{48}O_8$) are discussed.

3637. COMBES, G., BILLET, D., and MENTZER, M. Sur l'isolement, la structure et les propriétés d'un nouveau lignane de *Humbertia madagascariensis*. [The isolation, structure and properties of a new lignan of *H. madagascariensis*.] *Bull. Soc. Chim. France* 1959 (11/12), (2014-8). 29 refs. [F.f.] O.R.S.

The lignan ($C_{22}H_{26}O_6$) was isolated from the heartwood by ether extraction.

3638. BUCHANAN, M. A., and DICKEY, E. E. Liriodenine, a nitrogen-containing pigment of Yellow Poplar heartwood (*Liriodendron tulipifera*, L.). *J. organ. Chem.* 25 (8), 1960 (1389-91). 9 refs. O.R.S.

Liriodenine, $C_{17}H_{19}O_3N$, is a yellow pigment, with a melting point of 282°. A second pigment, containing methoxyl as well as N, was isolated in amounts too small for proper characterization.

813.3. Ash Constituents

See No. 3554.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See No. 3570.

813.5. Reaction with Metals

3639. PURUSHOTHAM, A. Corrosion of metals by wood. *J. Timb. Dryers' Pres. Ass. India* 5 (1), 1959 (1-11 + 6 photos). 13 refs. P.R.

To examine the corrosive effects of the direct and indirect contact of various Indian-grown woods on Cu, Pb, Fe, Sn, brass, and solder, the following exposure tests were made on *Adina cordifolia*, *Albizia* sp., *Cedrela toona*, *Dalbergia sissoo*, *Dichopsis elliptica*, *Dipterocarpus* sp., *Dysoxylum malabaricum*, *Eugenia* sp., *Litsea* sp., *Mangifera indica*, *Mitragyna parviflora*, *Picea morinda*, *Pinus longifolia*, *Polyalthia fragrans*, *Sapium* sp., and *Zanthoxylum rhetsa*: (1) burying the metals in green-wood sawdust; (2) suspending metal specimens in boxes with blocks of the wood or in a bottle with blocks of the wood, along with a small amount of water; (3) keeping small blocks of wood in a desiccator, metal specimens being placed over them on glass rods. *Albizia* sp., *Litsea* sp., and *D. elliptica* proved the most corrosive of the woods tested (at room temperature); *D. malabaricum* and *Z. rhetsa* slightly corroded Pb and Fe within the first 2 days of exposure, the corrosion showing no subsequent spread. Corrosion appeared to be autocatalytic, possibly because of the early dissolution of the protective oxide film by acid (analysis of corroded material revealed the presence of butyric or acetic acids). Bi-metal contact also increased corrosion. The timber vapours were found to be

acidic in character, but rapid seasoning to ca. 18% m.c. minimized the danger arising from the fermentation of cell constituents caused by microbiological attack and attack by wood-rotting fungi in green timber, particularly in conditions of high temperature and humidity. Complete results are presented in two detailed tables.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

3640. SAVARD, J., ANDRÉ, A.-M., and GUINET, P. Contribution à l'étude de la résistance des bois tropicaux aux acides minéraux. [The resistance of tropical timbers to mineral acids.] *Bois For. Trop.* No. 74, 1960 (25-34). [F.e.span.]

In an attempt to classify some 20 tropical hardwoods according to their resistance to HCl, HNO₃, and H₂SO₄, test pieces were soaked under conditions similar to those in industrial use, and measurements then made of their absorption rate, weight loss, and dimensional variability. The data are tabulated with those for *Pinus elliptica* as a comparison. Of the species tested, the following were the most resistant to HCl—*Khaya senegalensis* and *Azelia bipindensis*; to HNO₃—*K. senegalensis*, *A. bipindensis* and *Tectona grandis*; to H₂SO₄—*A. bipindensis*. It is concluded that *A. bipindensis* can safely be used with all three acids. In all cases it was found that acid treatment made the wood more susceptible to later action by alkaline solutions.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 2891, 3627, 3738, 3757, 3765.

3641. RUDMAN, P. Methods of testing durability. Part II. Laboratory tests. *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 269, 1960 (1-3).

Briefly describes and discusses laboratory tests developed to enable reasonable assessments of the biological resistance of timbers to be made after 6-12 months' exposure to fungus and insect attack. It is stressed that, though very useful in predicting the durability of timber, the tests should not be used to replace, but to supplement and accompany, the long-term field tests previously described. [See *F.A.* 22 No. 2409.]

815. Effect of Growth Factors on Structure and Properties

See also Nos. 2941, 3559, 3568, 3582, 3588, 3591, 3599, 3601, 3603, 3607, 3812.

3642. SAKATA, K., and SAEKI, H. [Wood properties of Chizu-Sugi (*Cryptomeria japonica* D. Don grown in Chizu district in Tottori Prefecture). II. On the variation of width and structural character of annual ring in the stem.] *Transactions of the Tottori Society of Agricultural Science, Tottori* 12, 1960 (137-41). 4 refs. [Jap.jap.e.] C.G.B.

[Cf. *F.A.* 20 No. 5169.] Presents data on variations with position within the tree in ring width, presence of normal and compression wood, and wood containing layers of resin cells, and the relations between ring width, density and late-wood %.

3643. L'vov, P. N. O kačestve drevesiny eli v drevostojah, formirujuščihsia iz molodnjaka, sohrannogo pri lesozagotovkah. [The quality of Spruce wood in stands formed from advance growth retained after logging.] *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (128-33). 7 refs. [Russ.]

Sample trees from advance growth left on an area logged 20 years previously, were divided into two groups: (a) ≥ 6 cm. and (b) < 6 cm. d.b.h., at the time of logging. In (a), samples were taken from wood formed both before and after, but in (b) only from wood formed after, the felling of the parent stand. The structure, physical, mechanical and chemical (i.e. for pulping) properties were determined. Ring width, late-wood %, density and volume shrinkage differed in wood formed before and after the felling; this could lead to warping and splits or shakes. Compression strength ||, particularly that of wood formed after the felling, was less than that of wood in the parent stand. There was not much difference between contents of lignin, cellulose, resins and ash in wood formed before and after the felling.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

3644. REINEKE, L. H. Pendulum cutting test standardization and pertinent cutting fundamentals. *For. Prod. J.* 10 (10; 11), 1960 (542-53; 571-6). 9 refs.

Discusses, mainly theoretically, but supported by results of tests with a knife or wedge having an edge angle varying from 20° to 170°, and plastic fillers to show up pressure zones, the fundamentals of fibre severance and chip formation, mainly in rip-sawing, and makes proposals for the preliminary standardization of three cutting tools, test blocks, etc. [Cf. *F.A.* 19 No. 4823; 22 No. 1035.]

821. Barking

See Nos. 3151-2, 3692.

822. Saws and Sawing

See also Nos. 3644, 3696-9, 3959.

3645. ANTOINE, R. Le sciage des bois tropicaux: principes fondamentaux et applications. [Sawing of tropical woods: fundamental principles and applications.] *Bois For. Trop.* No. 74, 1960 (35-49). 6 refs. [F.e.span.]

Sets out the fundamental principles of sawing (type of saw, feed speed, rate of sawing, thickness of kerf etc.) and applies them to the problems presented by certain species.

3646. JUVONEN, K. S. An introduction to the frame saw and its use in sawmilling. *J. S. Afr. For. Ass.* No. 35, 1960 (12-9).

Written by the Consulting Engineer, Metex Corp., Helsinki, for S. Africa, where the 200 sawmills employ 100 frame saws. This type of saw is best for a permanent mill sawing a majority of reasonably straight logs < 20 in. diam. Its great advantages lie in recovery, dimension and surface qualities, and ease of handling.

3647. KONOPLEV, P. S. Issledovanie napravljajuščih ustrojstv za lesopil'nymi ramami. [Investigation on the guides for frame saws.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (109-17). [Russ.]

Explains the influence of the main design parameters of the guides on the quality of sawing and the output of the saw.

3648. JUR'EV, JU. I. O val'covke ramnyh pil. [The roller-tensioning of frame saws.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (136-43). 13 refs. [Russ. russ.]

Examines the influence of roller-tensioning on the rigidity of frame-saw blades.

3649. JUR'EV, JU. I. Vlijanie val'covki na mehaničeskie svojstva ramnyh pil. [The effect of tensioning on the mechanical properties of frame-saw blades.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (125-8). 5 refs. [Russ. russ.]

Investigations showed that rolling the blades increased their hardness but reduced their strength.

3650. A circular saw run by wind. *FAO For. Equipm. Note No. D. 28.60*, 1960. pp. 1.

Describes a portable, wind-operated circular saw used to cut fuelwood on a farm in Tierra del Fuego, Argentina. With the wind at 40-50 km./hr., a ton of wood of 30-40 cm. diam. is cut into 40-cm. lengths in 1 hour.

3651. PAHLITZSCH, G., and DZIOBEK, K. Investigations on a horizontal log band saw. *Transl. For. Prod. Lab. Can. No. 137*, 1960. pp. 19. Transl. from *Holz Roh- u. Werkstoff* 17 (9), 1959 (364-76). Limited distribution. [See F.A. 21 No. 2380.]

3652. CHARDIN, A. Ruban à grumes vertical, horizontal, ou incliné? [Vertical, horizontal, or diagonal log band-mill?] *Bois For. Trop.* No. 74, 1960 (51-5). [F.e.span.]

Experiments have been made at the Centre Technique Forestier Tropical, Nogent-sur-Marne, with a bandsaw inclined at 45°, and its performance compared with saws at the conventional 85° and 15° (so-called vertical and horizontal), very much to its advantage.

3653. LOMBARDI, G. Neuerungen im Bau von Bandsägemaschinen. [Improvements in band-saw design.] *Holz Roh- u. Werkstoff* 18 (11), 1960 (427-31). 1 ref. [G.g.e.] P.R.

Discusses the designing of bandsaws according to the so-called "symmetrical principle", i.e. having both wheels mutually and equally inclined to each other. The geometrical and mathematical theory behind the principle is explained, and examples of the use of such saws are given. The advantages of such saws over conventional bandsaws are: less stress on the blade, fewer breakages, greater blade rigidity, the possibility of greater blade tensioning, less wear on the wheels, etc.

3654. LEVER, R. D. Band saw survey. *Res. Note West. Pine Ass. No. 5. 1511*, 1954 (rev. 1960). pp. 9.

A detailed survey of saw-filing practice in 146 mills in 5 regions (California, Oregon, Washington

and Idaho, Montana, and the Southwest), showing a wide variation in bandsaw tooth design between and within regions. Fundamental work to find an optimum tooth design is needed.

3655. VASIL'EV, G. M., and LIVŠIČ, N. V. K voprosu o parametrah agregata dlja raskrjaževki hlystov na sortimenty. [The parameters of a unit for cross-cutting tree-length logs into assortments.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (98-105). [Russ.]

In the context of the development of high-output, automated, cross-cutting units for work at industrial log depots, discusses the choice of saw type and dimensions, and the saw feed system. It is concluded that it would generally be best to use single-blade circular saws with inset teeth, but that in areas of large-sized timber the use of chain-saw units would be possible. The best saw feed will be that at which constant optimum sawing power of the motor is maintained.

3656. BRICE, D. C. Quality control of headrig production. *Res. Note West. Pine Ass. No. 5. 1922*, 1955 (rev. 1957). pp. 10. 8 refs.

Presents a means of measuring control over thickness of cut at the headrig. The inspection programme outlined employs statistical method in detecting undesirable and preventable variation. Increased material recovery and decreased manufacturing costs result. *From author's summary.*

3657. GERNET, G. M. Preselektivnoe upravlenie obreznym stankom s gidroprivodom. [Pre-selection control on an edger with hydraulic drive.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (105-10 + set of dgms.). [Russ. russ.]

Describes the design of the unit, its use, and increased output achieved.

3658. ANDERSON, J. C. Factors affecting the accuracy of edgers. *Res. Note West. Pine Ass. No. 5. 1611*, 1958 (rev. 1959). pp. 6.

A study of edgers was made to determine the causes of variation in the width of lumber and to find means for improving edger accuracy. The most important factors proved to be (1) the maintenance of the edger, (2) the design of the saw-shifting mechanism, (3) the quality of saw filing.

3659. PONGRACZ, A. F. Shadow line. *Res. Note West. Pine Ass. No. 5. 311*, 1952 (rev. 1960). pp. 4.

Discusses uses, costs and installation. The shadow line (formed by a light source and stretched wire) is particularly valuable with edgers, where it indicates the kerf before any ripping occurs. It reduces badly sawn lumber and waste, saves time, increases output and eliminates guesswork in ripping long lengths.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also Nos. 3598, 3814.

3660. WALTHER, R. Technisches Englisch. Zerspanende Werkzeugmaschinen: Hobeln-Räumen-Fräsen. [Technical English: Machines for planing, slotting and spindle moulding.] VEB Verlag Technik, Berlin. 1959. pp. 372. Price: DM. 21.

From *review in Holzforschung, Berlin* 14 (5), 1960 (160). [G.] P.R.

Presents systematic lists of English terms and their German equivalents (also noting differences between English and American usage, inexact equivalents, etc.) covering methods, tools, accessories, and machine components, with many explanatory illustrations.

3661. VOSKRESENSKIĬ, S. A. Osnovnye položenija račeta režuščej plastinki. [Basic calculations for [the forces acting on] a cutting blade.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (99–104). 2 refs. [Russ.]

A detailed theoretical study assuming an elastic rectangular blade.

3662. PIŽURIN, A. A. Vlijanie osnovnykh parametrov rezanija na usilija rezanija i čistotu obrabotki pri osevom točenii drevesiny. [Influence of the main cutting parameters on the cutting forces and cleanliness in axial turning of wood.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (111–29). 3 refs. [Russ. russ.]

An amplification of work already noticed [see *F.A.* 21 No. 4964; 22 No. 2423].

824. Forms of Joint. Jointing and Assembly

3663. GLOSS, R. H. Timber fastenings. *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST 1), 1959 (87–101). 8 refs. P.O.

Discusses design and conditions in use, different types of truss and the fastenings used, light framing, types of fastening, long-term testing, connectors, nails and bolts, trussed-rafter fastening devices, etc.

824.1. Nailed Joints

See also Nos. 3596–7.

3664. KNIGHT, E. Nailing study of White Fir, Douglas Fir, and Larch. *Res. Note West. Pine Ass.* No. 1. 122, 1950 (rev. 1960). pp. 4. 9 refs.

A study of means of reducing splitting while nailing. The following factors were examined: nail point, size, and spacing; grain type and slope; joints; specific gravity; moisture content. Experimental results are detailed elsewhere.

824.8. Glues and Gluing

See also Nos. 3681, 3858.

3665. Wood adhesives: a summary of their properties and uses. *Trade Circ. For. Prod. Aust.* No. 49, 1960. pp. [6]. 7 refs.

A five-page tabulated summary, with a brief introduction, listing the most important glues commercially available in Australia, with their properties, applications, and methods of use.

3666. Glues for the millwork industry. *Res. Note West. Pine Ass.* No. 5. 521, 1953 (rev. 1959). pp. 11.

Discusses the characteristics and cost of the following glue types: liquid hide; casein; urea-formaldehyde; melamine and melamine-ureas; resorcinol and phenol resorcinol; polyvinyl; starch; phenol; and contact cements. A short glossary of gluing terms is appended.

3667. TAKASHIMA, T., ARIGA, K., and CHUBACHI, M. [Researches on blood glue. XIII. On mixed glue of urea formaldehyde resin and blood glue.] *J. Jap. Wood Res. Soc.* 6 (4), 1960 (165–70). 16 refs. [Jap.jap.e.e.] P.R.

[Cf. *F.A.* 19 No. 4839.] Results of plywood gluing strength tests [tabulated fully in English] indicated that the addition of small %'s of blood glue to urea-formaldehyde [UF] resin neither increased nor decreased its gluing strength or water resistance in any marked degree. Similar observations on plywood bonded with blood glue to which small %'s of UF resin were added indicated a prolongation of the pot life of the mixture and an improvement in the ageing property of the adhesive film. The amount of NH_4Cl used as a hardener had no influence on adhesive strength or water resistance.

3668. HERZBERG, W. J. *Pinus radiata* tannin-formaldehyde resin as an adhesive for plywood. *Aust. J. appl. Sci.* 11 (4), 1960 (462–72). 15 refs. P.R.

Tannin from *P. radiata* bark was formulated into an adhesive complying with the requirements of the Australian Standards Specification for water-proof adhesives [see *F.A.* 15 No. 4142] and of the British Standards Specification for weather- and boil-proof adhesives (B.S. 1204, 1956). Easily prepared from the extract, the adhesives can be used for plywood manufacture without modifying existing procedures or machinery. *From author's summary.*

3669. MAJATIN, A. A., and PETROV, B. M. Mechanizacija operacij namazki listov špona. [Mechanization of gluing of plies.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (114–6). [Russ.]

Describes and illustrates an experimental machine for stacking the plies as they come from the glue rollers.

3670. Survey of equipment for edge-gluing of lumber. *Res. Note West. Pine Ass.* No. 5. 511, 1949 (rev. 1960). pp. 9.

Classifies commercially available equipment under: clamp carriers; batch presses (high-frequency and steam-heat glue-line curing); and continuous presses (steam-heated glue-lines and high-frequency-cured glue-lines).

3671. Survey of end gluing equipment. *Res. Note West. Pine Ass.* No. 5. 512, 1959 (rev. 1960). pp. 5.

Describes, with data on performance and costs, equipment offered by various U.S. companies for machining and/or assembling finger joints.

3672. BASSETT, K. H. Effect of certain variables on strength of glued end joints. *For. Prod. J.* 10 (11), 1960 (579–85). 7 refs.

In butt-end joints of Balsa specimens varying in sp. gr. from 0.08 to 0.27, joint strength increased non-linearly up to sp. gr. 0.2, but not beyond. Joint strength (maximum 2200 lb./sq. in.) was below the tensile strength || of the specimens, except in the lightest ones. Sawn surfaces gave stronger joints than sanded ones, and of 3 viscosity levels of the resorcinol adhesive used, the lowest was best.

3673. STANGER, A. G. The compatibility of certain glues and water-borne preservatives used in the gluing of Tawa, the sapwood of Rimu and Matai, and the heartwood of Radiata Pine. *Inter. Res. Release (For. Prod.) For. Res. Inst. N.Z. For. Serv. No. 8*, 1960. pp. 4.

Glue-joint tests were made using two formulations of urea-formaldehyde (U.F.), melamine-urea-formaldehyde (M.U.F.), resorcinol-formaldehyde (R.F.) and phenol-resorcinol-formaldehyde (P.R.F.), and timber treated with three preservatives—polyborate (P.B.), copper-zinc-chrome-arsenate (C.Z.C.A.), and copper-chrome-arsenate (C.C.A.). From an analysis of the 60 combinations studied, the following facts emerge: (1) Rimu (*Dacrydium cupressinum*) joints showed no significant losses in bond strength; (2) Radiata-Pine heartwood joints showed significant loss of strength for the combination P.B./P.R.F.; (3) C.Z.C.A. caused no significant loss of strength; (4) significant losses in bond strength were observed with certain glues when Matai (*Podocarpus spicatus*) and Tawa (*Beilschmiedia tawa*) were treated with P.B. and C.C.A.

825. Cleaving. Adzing. Mechanical Comminution

See also Nos. 3716, 3824, 3826-7, 3864.

3674. Articles on wood chips, chipping and chippers. *Res. Note West. Pine Ass. No. 7*. 242, 1952 (rev. 1960). pp. 7.

A bibliography containing references to ca. 50 articles published in the period 1947-57, nearly all in N. America. Summaries of the articles are given in most cases.

3675. STOLZ, E. Schüttgewichtsbestimmung von Hackschnitzeln. [Determining the bulk density of wood chips.] *Wochenblatt für Papierfabrikation, Biberach* 88 (6), 1960 (203-7). [G.] P.O.

Describes and illustrates the equipment used, and presents tables and graphs showing the effect of e.g. chip size and loose or tight packing into the container, on the density values of Spruce and Beech chips.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

3676. VOL'SKII [VOL'SKIJ], E. V. The grinding of cutters for peeling wavy surfaced veneer. *Transl. Commonw. Sci. Industr. Res. Organ. Aust. No. 4861*, 1960. pp. 3 + 1 photo, 3 dgms. Transl. by E. Feigl from *Derev. Prom.* 7 (3), 1958 (7-8). Limited distribution. [See F.A. 20 No. 2393.]

3677. Veneer cutting. *Technical Note, Forest Products Research Institute, Laguna, Philippines No. 5*, 1960. pp. 4 + 3 dgms. 4 refs. P.R.

A brief general discussion of the principles of rotary veneer cutting of commercial Philippine hardwoods, most of which can be peeled unheated, especially those of low sp. gr. and strength. The effects of lathe condition, set-up, and operation, and of the quality of the bolt, on veneer quality are examined.

827. Bending. Moulding (other than by Cutting)

See also No. 3784.

3678. BLANKENSTEIN, C. Das Biegen von Vollhölzern. [Bending solid wood.] *Holztechnik* 41 (2), 1961 (48-50). 5 refs. [G.] P.R.

Reviews German work [cf. F.A. 13 Nos. 1571, 4263], in particular a standard work [see F.A. 17 No. 926], and summarizes the general recommendations on the steaming schedule.

829.1. Finishing

See also No. 3598.

3679. BROCKER, W. Holzbeizen und Holzbeizverfahren. I.—Eigenschaften und Wirkungsweise der Holzbeizen. II. Farbstoffbeizen—chemische Beizen—Kombinationsbeizen. [Wood stains and staining processes. I. Properties and mode of action of stains. II. Colour stains, chemical stains, combined stains.] *Holz-Zbl.* 86 (151; 156), 1960 (2137-8; 2243-6). [G.]

A survey of the present position in this field, with special reference to W. Germany.

3680. KRPAN, J. Gubitak kod brušenja šperovog drva. [Losses in sanding plywood.] *Drvena Ind.* 11 (11/12), 1960 (179-81). [Croat.e.] P.R.

Using 7 types of plywood in regular mill production, 607 measurements were made of the thickness of wood removed by sanding the face and back. All the plywoods had a back of Beech, a centre of Beech or Poplar, and a face of rotary-cut Beech, Maple, Okoumé, or Oak, and were produced in nominal thicknesses of 4, 5, 6 and 8 mm. Sanding loss was also measured on 13 Okoumé/Silver Fir/Okoumé blockboards (nominal thickness 22 mm.). The thickness removed ranged from 0.07 to 0.83 mm.; the arithmetical mean thickness removed from the various types and thicknesses ranged from 0.21 to 0.46 mm.

3681. HERMANN, A., and RASMUSSEN, C. A. The effectiveness of gluing encased knots in Ponderosa Pine common boards. *Res. Note West. Pine Ass. No. 7*. 311, 1941 (rev. 1959). pp. 4.

Gluing encased knots increased their resistance to removal to ca. 2-2½ times that of unglued knots when tested at about the same moisture content as when glued. Knots glued at ca. 12% m.c. were much tighter when tested at 20 than at 12% m.c. It was found that the treated knots are not glued at all in the ordinary sense of the word; the glues appear to act as "void" fillers and "wedges" only, of the space between knot and knot-hole, and not as an adhesive. It seems probable that a form of cement employing a binder that is also a resin solvent might act more effectively than the water-soluble glues used in this test.

3682. SARVIS, J. C. Exterior clear finishes. *Res. Note West. Pine Ass. No. 3*. 221, 1953 (rev. 1960). pp. 5.

In tests on clear-finish formulations as exterior protective coatings for wood, 90% of products failed to give a satisfactory coating for a period of >8 months, and the remaining 10% had a maximum

life of only 1½ years. Primary causes of failure were sunlight, moisture, and lack of knowledge about proper choice and application of materials. Recommendations for use on new and old constructions are given.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 3150, 3736-8, 3755.

3683. TEZUKA, Y. **Fuelwood in Japan.** *For. Occ. Pap. FAO* No. 9, 1960. pp. 45 + 19 photos, 1 set of drawings, 30 tbs., 7 maps.

An account of demand and supply of firewood and charcoal, and methods of utilization; production of firewood and charcoal; and fuelwood plantations.

3684. **Pitprops in British coal mines. Increasing substitution of steel for wood.** *Timb. Tr. J.* 236 (4404), 1961 (60).

Tabulates the length of underground roadways in use, supported by: steel arches; girders, bars etc.; timber and other means; and unsupported; and the same classes as %, all at 30 June 1938, 1953, 1956-60. Also at the same dates the numbers of steel props; steel bars or straps; wooden props; and wooden bars in use at the working face. The decline in the use of wooden props has been mainly at the expense of imports, which now stand at ca. 25% of the 1938 figure.

3685. **Technical considerations on the rational utilization of wood poles for power and communication lines [in Asia and the Far East].** Economic Commission for Asia and the Far East, Bangkok. No. E/CN. 11/I & NR/Sub. 1/L. 7, 1959. pp. 89 + 7 sets of dgms. 9 refs. (Obtainable from FAO Regional Office for Asia and the Far East, Bangkok.)

Contains sections on: Present situation with respect to utilization of wooden poles; Materials used for power and communication lines; Technical considerations; Inspection, service records and maintenance of wooden poles; Standard specifications; Estimates of requirements (by countries).

3686. ANDERSON, I. V. **Western Red Cedar poles from British Columbia.** *J. For.* 59 (1), 1961 (14-6). 5 refs.

British Columbia has about 121 million Western Red Cedar poles, enough for 300 years' supply at present demand. These poles have the same physical and mechanical properties as those of the Pacific Northwest (U.S.A.). N. American requirements for the next 25 years should be amply secured.

3687. CHAN, K. K. **Tests on methods of fastening crossarms to wood poles for 11/33 kV transmission lines.** *Res. Pamphl. For. Res. Inst., Kepong* No. 31, 1960. pp. 21. 4 refs.

3688. TEROUIN, A. **Trends in the utilization of wood and its products: Sector study on railway sleepers.** *Publ. Timb. Comm. Econ. Comm. Europe* No. ST/ECE/TIM/1, 1960. pp. 53 + 23 + 10 tbs. + 7 gphs.

Presents and discusses statistics on: the length of

track, spacing and replacement of sleepers; annual consumption of sleepers; species used, specifications, preservative treatment, maintenance, and consumption by countries, of wooden sleepers; steel sleepers; reinforced concrete sleepers; financial and economic considerations; all with reference to Europe.

832. Mills, Their Functions and Products

3689. BERŠADSKIJ, A. L. **Rasčet proizvoditel'nosti avtomatičeskogo potoka v derevoobrabotke. [Calculating the output from an automated flow-line in woodworking.]** *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (118-24). 3 refs. [Russ.]

A detailed theoretical work.

3690. GRUBE, A. È., and SANEV, V. I. **Rasčet nadežnosti avtomatičeskijh linij i oborudovanija v derevoobrabotke. [Calculating the reliability of automated production lines and automatic equipment in the woodworking industry.]** *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (112-27). [Russ.]

A mathematical treatise.

3691. SANEV, V. I. **O stepeni avtomatičnosti derevoobrabatvyvajuščih stankov vhodjaščih v sostav avtomatičeskijh linij. [The degree of automation of woodworking machines making up automatic [production] lines.]** *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (94-8). [Russ.]

A theoretical study.

3692. Tekniska meddelanden från leverantörer till sågverk, träförädlingsindustrier, cellulosafabriker, pappersbruk. **[Technical information from suppliers to sawmills, woodworking industries, and pulp and paper mills.]** *Svensk Trävarutidn.* Annual issue 1959/1960 (1960), (279-313). [Sw.]

Equipment described and illustrated includes that for sorting (Tornborg & Lundberg AB) and transport in the mill (Kone OY), and the Sund stationary barking machine, type BME-14 (Sunds Verktäder AB).

832.1. Sawmills and Planing Mills

See also Nos. 3644 et seq., 3716, 3802, 3959.

3693. CHURCH, J. W. **Automation and mechanization in the sawmill.** *Timb. Technol.* 69 (2259), 1961 (19-22).

A careful analysis of possibilities and requirements of automation and mechanization in sawmilling, with particular attention to the sawyer's position, the edger operation, and the trimmer position.

3694. PESOCKIJ, A. N. **Napravlenija naučno-issledovatel'skoj raboty v oblasti lesopilenija. [Trends in sawmilling research.]** *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (106-11). [Russ.]

A general discussion, in the context of Soviet conditions, covering (1) the complete utilization of wood, (2) improving the work of existing equipment, and the development of new equipment, (3) the elaboration of new processes based on the new

equipment, and (4) mechanization and automation. The co-ordination of research work is regarded as of high importance.

3695. KNIGHT, E., and ANDERSON, J. C. **Mechanized sorting requirements of the Western Pine region.** *Res. Note West. Pine Ass.* No. 5.1711, 1960, pp. 6. 2 refs.

A study of sorting programmes for green lumber in mills using different sizes of mechanical sorters. The requirements of the chief species of the region are summarized.

3696. WALTERS, E. **Scrag vs. band mill, comparative yield and production.** *Res. Note West. Pine Ass.* No. 5.1925, 1960. pp. 16.

Results of this detailed study indicate that the scrag mill is not the best method of small log breakdown because of the lower volume and value recovered. A band mill designed for small logs would yield a higher net return. [Cf. *F.A.* 20 No. 3793.]

3697. WALTERS, E. O. **Comparative efficiency [of] band vs. log gang [mills] on small logs cut to dimension.** *Res. Note West. Pine Ass.* No. 5.1923, 1959. pp. 13.

In a study in a mill operating both (a) a double-cutting band and (b) a log gang saw, (a) gave 4.1% higher yield, \$0.93/1000 bd. ft. higher mean lumber value, and 36% higher production than (b).

3698. **Comparison of taper sawing and through-and-through sawing.** *Mimeo. For. Prod. Lab. Can.* No. O-184, 1960. pp. [4].

In this paper, "taper-sawing implies sawing parallel to two faces" (not four). Diagrams and data are presented to permit an evaluation of the two methods, on the basis of log recovery %, for 12-ft. logs with 1 in. taper in 4 ft., and of 14, 10 and 7 in. diam. In each case, recovery % was greater with taper sawing, but grade recovery and lumber dimension are not taken into account.

3699. WALTERS, E. **Comparative headrig 4/4 lumber recovery and capacity.** *Res. Note West. Pine Ass.* No. 5.1924, 1960. pp. 7.

Lumber volume and grade recovery on logs of 6-19 in. diam. were compared using (a) a bandsaw plus horizontal resaw, and (b) bandsaw and horizontal resaw plus head framesaw, on sound 16-ft. Idaho White Pine. Lumber recovery from (a) was lower than that from (b) on logs ≤ 15 in. diam., but approximately equal on logs ≥ 16 in. diam. Compared with other headrig studies, lumber recovery with (b) was average or above on small logs but low on large logs. There was no difference in green lumber grade recovery between the two sawing methods and log grades tested.

832.2. **Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies**

See also Nos. 3569, 3665 *et seq.*, 3676-7, 3680, 3707, 3858.

3700. **30th annual plywood review.** *Lumberm.* 87 (13), 1960. pp. 188.

Contains articles on: production statistics; uses

of plywood in packaging, flooring, building construction, boat-building, and agriculture; the manufacture, finishing and marketing of plywood; a directory of U.S.A. and Canadian plywood and veneer manufacturers; and advertisements of plywood machinery and products.

832.8. **Integrated Mills and Combinations of Mills**

3701. PIMENOV, A. N., and LEBEDEV, N. I. **O pererabotke hlystov na lesoperevalochnykh kombinatah. [Conversion and utilization of tree-length logs at combined depots.]** *Lesn. Zh., Arhangel'sk* 2 (6), 1959 (54-9 + 1 set of dgms.). [Russ.]

Large combined depots are to be set up in river basins in the North and Far East of the U.S.S.R. (e.g. the Amur, Pechora, Vychegda, and Ob basins) to handle floated tree-length logs. Plans are presented for such a depot, which would include departments for: log breakdown; sawmilling, sleeper production, and the manufacture of blanks for the furniture and building industry; building standard houses; sawing pitprops and pulpwood bolts to length; producing box shooks and blanks from fuelwood; plywood and veneer production; hogging waste; waste utilization (e.g. by producing building boards, distillation, etc.).

833. **Timber in Buildings and Engineering Structures (Manufacture and Use)**

3702. EBY, R. E. **Design standards for timber structures.** *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST2), 1959 (1-8). P.O.

Reviews some U.S.A. standards for structural designs and lumber grading rules during the past 15 years.

833.1. **Building Components and Fittings: General**

See also Nos. 3148-9, 3663, 3816, 3861.

3703. DEGENKOLB, H. J. **Design of pitched and curved timber diaphragms.** *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST1), 1959 (65-75). 1 ref. P.O.

Presents a brief review of the internal action of timber diaphragms, with a study of the stresses caused by curving or sloping portions of the diaphragm to conform to common truss shapes. Presents illustrations showing the magnitude of truss stresses for common designs. *From author's summary.*

3704. HERMANN, A. **Western Pine glued-cleat sheathing panel.** *Res. Note West. Pine Ass.* No. 8.101, 1944 (rev. 1960). pp. 7.

More than 100 walls, 7 ft. $\times$ 12 ft., were tested to failure to determine relative resistance to racking imparted by different designs of sheathing and methods of attachment. Findings are outlined, and a new type of panel for sheathing and sub-floors in frame houses is described, giving substantial savings in construction costs and improved performance.

3705. **Timbers of Tanganyika. Flooring timbers.** Utilisation Division, Forest Department, Moshi, Tanganyika. 1960. pp. 17. 6 refs.

Includes factors affecting choice, movement and

moisture content, method of sawing and notes on grain, colour and texture of 27 suitable species, classified for pedestrian traffic (25), industrial use (15), decorative qualities (12), small movement (10), resistance to chemicals (4), and resilience (4).

833.3. Special Uses in Factories and Workplaces

3706. CHAMPATI, R., SESHADRI, P., and JAYARAMAN, R. Utilization of indigenous timbers for cooling tower construction. *J. Timb. Dryers' Pres. Ass. India* 6 (1), 1960 (16-21). 9 refs. P.R.

Briefly examines the factors to be considered in the construction of such towers, e.g. types of deterioration (chemical and fungal attack, and water erosion), and gives details of the construction of cooling towers using *Cedrus deodara* (for the structural parts) and *Pinus longifolia* treated with creosote/fuel-oil mixture at 8 lb./cu. ft. (for filling and sheeting).

833.5. Wood in Bridges, Culverts etc.

3707. LUND, C. V. Timber bridges on the railways. *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST1), 1959 (77-86). P.O.

Discusses service life, statistics on the use of timber in bridges, specifications for timber used, design of bridges, research and the use of glued laminated construction, with particular reference to the U.S.A.

3708. DREW, F. P. Load consideration for [wooden] beams [in railway bridges]. *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST1), 1959 (113-22). 5 refs. P.O.

833.8. Wood in Hydraulic, River and Marine Uses

3709. OLIVER, A. C., and RICHARDSON, H. Sea defence groynes. *Inform. Bull. Timb. Developm. Ass., Lond.* No. B/1B/1, 1959. pp. 30 + 24 photos. 30 refs. Price 3s. 6d.

Gives details of the quantities and species of timber used in groyne construction, analysing the required properties of the materials used and considering their performance in groynes round the S. and E. coasts of the U.K. Brief reference is made to the economics of using different designs and timbers.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also Nos. 3747-8.

3710. DENISENKO, V. V. Pressovannaja drevesina—zamenitel' metallu v podšipnikah. [Compressed wood—a substitute for metal in bearings.] *Lesn. Prom.* 1960 (12), (26-8). [Russ.]

Compares the wear of metal/metal and metal/wood bearings (the wooden bearings being bushes of various types of compressed wood, chiefly end-grain-bent, and contour-compressed) working in abrasive surroundings, e.g. tractor tracks, tractor winches, etc. It is concluded that end-grain-bent wood and contour-compressed wood are eminently

suitable for such applications, having very low rates of wear and being considerably cheaper than conventional metals or plastics. Swift organization of production of such bearings is regarded as highly desirable.

836. Furniture and Cabinet-Making.

Ecclesiastical Woodwork. Carving. Marquetry. Wooden Ornaments

See also Nos. 3531, 3772, 3861.

3711. LETSKY, B. M. Impressions of the Soviet furniture industry. *Wood* 25 (12), 1960 (498-9).

Based on a visit to 8 factories. Some of the factories and their products are described, including some techniques in advance of British and/or American practice.

3712. REHMAN, M. A., and KUKRETI, D. P. Timber—Bamboo furniture. *J. Timb. Dryers' Pres. Ass. India* 5 (4), 1959 (8-10 + 5 photos). 3 refs. P.R.

[Cf. F.A. 19 No. 4910.] Discusses briefly the preservative treatments, seasoning, and physical properties of the species used, viz. *Dendrocalamus strictus*, *Bambusa polymorpha* and *B. nana*, and their importance in furniture manufacture. Mention is also made of the use of *Mangifera indica*.

3713. GRAHAM, P. H. Beech for furniture. *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 20, 1960. pp. 16. 12 refs.

Discusses the uses of *Fagus grandifolia* in furniture making.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 3674-5, 3683, 3825, 3841, 3872, 3874, 3959.

3714. HORNE, R. C. Utilization of sawdust and shavings. *Res. Note West. Pine Ass.* No. 7.231, 1950 (rev. 1959). pp. 7.

Reviews established and other possible large-volume uses for this material (amounting to 18% of log volume), classified under the headings: chemical uses; fibre uses; particle uses (pressed or moulded); fuel; uses because of special physical qualities.

3715. Anvendelse av skovbrugets og savværksindustriens træaffald. [The use of waste wood from forestry and sawmills.] *Dansk Skovforen. Tidsskr.* 45 (11), 1960 (441-78). [Dan.]

Four papers with discussion. Subjects covered by P. Moltesen and O. Kring include the reduction of waste in the forest, the use of sawdust and bark for compost, the production of chip- and fibreboards, and the use of wood and of chips for fuel. Two more detailed papers concern: Chips as fuel (L. Vigen); and Hardwood pulp (F. Juncker).

3716. SEHEULT, L. R. Chips down East. *Timber of Canada* 22 (1), 1961 (40-5, 75).

Reviews the history and prospects of chip recovery in the mills of the Maritimes, with a map locating all important sawmills and pulpmills, and data on production. An annual chip recovery of 200,000

dry tons is predicted for New Brunswick and Nova Scotia in the next few years.

3717. Fliseldning. [Chips as fuel.] *Svenska Mejeritidningen, Karlskrona* 51 (36), 1959 (423-33). [Sw.] C.B.D.S.

Shortened versions of two papers read at a meeting of the Sv. Mejeritekniska Förening on: Aspects of chips as fuel (*M. Sundström*) and Equivalent quantities of chips and oil as fuel (*W. Ånäs*). Both deal particularly with the use of fuel chips in the dairy industry.

3718. The use of wood chips for fuel in Finland. *FAO For. Equipm. Note No. D.27.60*, 1960. pp. 5.

Describes chip-burning equipment fitted to central-heating plants, and the general planning of a central-heating plant.

3719. MANGENOT, F., and JACQUIN, F. Produits d'humification des sciures. Quelques caractéristiques physiques et chimiques. [Humification products of sawdust. Some physical and chemical characters.] *Plant & Soil* 13 (3), 1960 (291-6). 5 refs. [F.]

Tabulates data on the optical density in the visible spectrum, the coagulation by CaCl_2 of NaOH and NaF extracts, and the C/N ratio of the following: (1) humic acids from mull rendzina, the A_0 horizon of a Vosges podzol, a forest rendzina, and the fulvic acid from the B_2 horizon of the same podzol; (2) the samples before described [see *F.A.* 21 No. 2466; 22 No. 1076]; (3) ten further samples of chips and sawdust in various stages of degradation; (4) humic acids produced by 8 months' pure cultures of two fungi.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

3720. Proceedings of the Fourth Annual Meeting of the Committee for the protection of timber; Appendix I, II, III. *J. Timb. Dryers' Pres. Ass. India* 5 (2), 1959 (24-44). P.R.

Introductory remarks outlining the scope of the meeting, with 3 appended reports by R. N. Datta, A. Purushotham and K. R. Nair, discussing the work and future plans of various Indian regional centres, particularly on *Sphaeroma* and *Limnoria*.

841. Wood Preservation

See also Nos. 3673, 3688, 3706, 3712, 3750, 3753-4, 3778, 3842, 3859-60.

3721. GERSONDE, M. Windkanal für zeit-raffende Prüfung der Verdunstbarkeit von Holzschutzmitteln. [A wind tunnel for the accelerated testing of evaporation of wood preservatives.] *Materialprüfung, Düsseldorf* 2 (8), 1960 (307-8). 1 ref. [G.] N.C.L.

Describes a wind tunnel for the simultaneous testing of many specimens, with automatically controlled temperature changes, recording apparatus, etc.

3722. PETROWITZ, H.-J. Untersuchung von Teerölen mit Hilfe der Kieselgelschicht-Chromatographie. [Analysis of coal-tar oils by thin-layer

(silica-gel) chromatography.] *Materialprüfung, Düsseldorf* 2 (8), 1960 (309-10). 15 refs. [G.] N.C.L.

A description of the method, including chromatograms of a coal tar oil and some coal tar oil components. [Cf. *F.A.* 21 No. 4909.]

3723. NARAYANAMURTI, D., and PURUSHOTHAM, A. ASCU-wood preservative. *Indian For. Rec. (n.s.) Wood Pres.* 1 (1), 1956 [1958]. pp. [ii] + 72 + 17 plates. 20 refs.

A monograph on the properties and behaviour of the preservative, including tabulated data on accelerated (graveyard) and service tests, in India and elsewhere, of various timbers (including bamboo) and products—including poles, fencing, sleepers, harbour installations, veneer, plywood, wood-wool boards, etc.

3724. GEORGE, J. Tolerance of birds to Ascu- and creosote-treated nesting sites. *Indian For.* 86 (12), 1960 (753-4). 2 refs.

Notes on species that have been observed at Dehra Dun successfully raising broods in nests either in holes in treated timber or in nests built on or amidst it.

3725. TEWARI, M. C. Testing of wood preservatives. Part III. Basilit UA and Basilit UA Spl. *J. Timb. Dryers' Pres. Ass. India* 5 (1), 1959 (17-25). 12 refs. P.R.

Gives tabulated results of laboratory (1) leaching tests, and (2) accelerated durability tests on $2 \times 2 \times 24$ - and $2 \times \frac{1}{2} \times 6$ -in. Chir (*Pinus roxburghii*) and Sal (*Shorea robusta*) sapwood blocks treated with (a) Basilit UA and (b) Basilit UA Spl. [distinguished mainly by the use of Na salts in (a) and K salts in (b)]. It was found that, even after air-drying (a)-treated Chir blocks for 6 weeks, 31-43% NaF and ca. 14% Na_2HAsO_4 were leached out; for Sal blocks these values were 29-47 and 12-14% respectively. After treatment (b), followed by 6 weeks' air-drying, leaching amounted to 24-32% NaF and 12-66-14-57% K_2HAsO_4 (Chir) and 12-55-17-98% NaF and 6-28-14-28% K_2HAsO_4 (Sal). The fact that 8-21% of dichromate was leached out of Chir blocks after 6 weeks' air-drying, while remaining almost completely fixed in Sal, appeared to confirm earlier results [*F.A.* 16 No. 1078]. Although still too early to draw definite conclusions, the performance of the preservatives to date indicates that they are unlikely to prove satisfactory.

3726. PURUSHOTHAM, A., and TEWARI, M. C. Testing of wood preservatives, Part IV. (Leaching of fire retardant-cum-antiseptic compositions). Part V. (Solubility in water of Ascu in treated wood). *J. Timb. Dryers' Pres. Ass. India* 5 (4), 1959 (2-7, 11-5). 10 refs.

(IV). In order to study the effectiveness of the composition (a mixture of $\text{Na}_2\text{Cr}_2\text{O}_7$, ZnCl_2 , CuSO_4 and H_3BO_3 in the ratio, by wt., of 6/5/1/3), Chir and Sal sapwood blocks ($5.0 \times 2.5 \times 1.5$ cm.) were treated at 3 different concentrations and subjected to leaching at both room temperature (19°C .) and 40°C . after air-drying for 2, 4 and 6 weeks. The results show that, even after air-drying for 6 weeks and leaching at 19°C ., 10.96-23.70% ZnCl_2 and

23.55–30.0% H_3BO_3 were leached from Chir blocks; for Sal under similar conditions these values were 10.0–13.8 and 30.0–32.48% respectively. At 40° heavier leaching of $ZnCl_2$ and H_3BO_3 occurred, but Cu remained almost entirely fixed in both specimens and a small amount of Cr leached out only from the Chir blocks. A slightly modified compound, i.e. substituting a borax/ H_3BO_3 combination for H_3BO_3 alone, produced a rather better resistance to leaching by water in both types of block (air-dried for 3 weeks and leached at 23°). Analysis of $10 \times 0.8 \times 0.8$ -cm. samples from fire-proofed Chir and *Terminalia tomentosa* sleepers after 4 years in service showed that losses caused by leaching ranged from 71.96 to 100%. Work is continuing on improving the fixation of the B and Zn ions without impairing the fire-retardant properties of the formulation. (V). To study the effectiveness of the fixation of Cu and As ions in timber in the presence of $Na_2Cr_2O_7$ (vs. the K salt, which is held to be very satisfactory), Chir and Sal sapwood blocks were treated with 2, 4 and 6% Ascu and air-dried for 2, 4 and 6 weeks, and subjected to leaching at room temperatures (14–22°) and at 40°. The results, tabulated in detail, indicated that both the Na and K dichromates were equally satisfactory in fixing the Cu and As ions in the timber. The relative cheapness of $Na_2Cr_2O_7$ is rather offset by its hygroscopicity which makes its early application after mixing essential. Differences in the electrical conductivity of timbers treated with the dichromates must be further studied to assess their true practical value.

3727. TEWARI, M. C. Effect of species on the fixation of wood preservative chemicals in timber. *J. Timb. Dryers' Pres. Ass. India* 6 (2), 1960 (28–32). 7 refs. P.R.

To determine the fixation of (a) $ZnCl_2$, (b) $CuSO_4$ and (c) chromated $ZnCl_2$ in the heartwood (h.w.) and sapwood (s.w.) of Chir and Sal, s.w. of Deodar (*Cedrus deodara*) and Teak, and in Mango (*Mangifera indica*) and Semul (*Bombax malabaricum*), wood samples were treated experimentally with aqueous solutions of 3.02% $CuSO_4$, 3.18% $ZnCl_2$ and 5.74% chromated $ZnCl_2$ and subjected to leaching after periods of one to 3 weeks' air-drying. The results obtained indicated that resistance to leaching increased with increased drying time, particularly in the case of (c) after 3 weeks. Better fixation was obtained for (b) than (a), particularly after 3 weeks' air-drying, though the fixation of neither could be considered satisfactory under exposed conditions. Compared with the other species, Chir h.w., Deodar s.w., and Mango appeared to give better fixation of (a) and (b), leaching being <25%. Better fixation of $ZnCl_2$ in the presence of dichromate occurred in Deodar, Semul and Mango than in Sal, Chir and Teak. More data on each species and preservative are required and further work along these lines is in hand.

3728. PURUSHOTHAM, A., and TEWARI, M. C. Studies on the effect of size of specimens on the leaching of inorganic wood preservatives from treated timber. *J. Timb. Dryers' Pres. Ass. India* 6 (4), 1960 (3–9). 8 refs. P.R.

Chir and Sal blocks of 4 sizes, viz. (a) $2.5 \times 2.5 \times 1.5$, (b) $5.0 \times 2.5 \times 1.5$, (c) $10.0 \times 2.5 \times 1.5$, and (d) $10.0 \times 3.0 \times 2.5$ cm., were treated with (i) 3.18% $ZnCl_2$, (ii) 3.02% $CuSO_4$, and (iii) 5.74% chromated $ZnCl_2$, air-dried for one and 3 weeks, and leached with distilled water according to a procedure already described [cf. F.A. 16 No. 1078]. Results indicated a decrease in the % of leaching with increased size of blocks, and also with increased drying time; Cr, however, was almost completely fixed in Sal, irrespective of block size or length of drying time, whereas only with the largest Chir blocks was dichromate almost wholly fixed after 3 weeks' drying. Thus it may be stated that, in general, the leaching of inorganic toxic ions in treated timber may be prevented or reduced by one or more of the following physico-chemical causes: (1) chemical reactions between the toxic ions in the preservative and various chemical substances in the wood, particularly in the presence of dichromate in the treating solution, yielding water-insoluble compounds; (2) formation of insoluble basic chlorides on exposure to atmospheric conditions; (3) surface absorption by electro-kinetic forces; and (4) deeper penetration into interior layers of the timber, either under external pressure or by diffusion, or by creating swelling of the fibres with retention between the cellulose chains. Further large-scale tests on sleepers, poles, beams, etc., under practical conditions, are suggested.

3729. JAIN, J. C., and LAGUS, A. Studies on the fixation of wood preservatives in timber. *J. Timb. Dryers' Pres. Ass. India* 6 (4), 1960 (10–7). 8 refs. P.R.

Since $CuSO_4$, As_2O_5 and $ZnCl_2$ are highly leachable if used alone, a study was made of the fixation of the following commercial preservatives that contain them: (1) Lahontuo, a Finnish water-soluble type containing As, Cu and Cr salts (similar to Boliden K-33); (2) Wolmanit-UR (German); (3) Tancas-C (English); (4) K-P, a Swedish product similar to Cu PCP, in an ammoniacal solution; (5) a Celcure-type preservative containing 50% $CuSO_4$, 48% $Na_2Cr_2O_7$, and 2% H_2CrO_4 ; (6) Ascu; and (7) a combined fire-retardant and preservative [see F.A. 14 No. 768]. Each was applied to separate 5-g. lots of *Pinus sylvestris* sawdust which were leached at 1-, 5-, 12- and 21-day intervals. The results obtained (presented in graphs) indicate that (i) ca. 99% As fixation was obtained for (3) and (6) vs. ca. 80% for (1); (ii) a steady improvement in Cr fixation occurred throughout the 21-day air-drying period, exceeding 97% for (6) and (3), whereas with (1), the fixation of Cr in preference to Cu and As occurred after only 5 days, remaining constant at ca. 97%; (iii) total fixation of salts in (3) and (6) reached a max. value of >95% in 21 days, vs. ca. 85% for (1); and (iv) Cu fixation in (6) was slightly better than in (3). In (4) ca. 24% CuO was leached out after 1 day's air-drying, with no significant improvement observable even after 21 days. Fixation of (5) was very satisfactory, ca. 3% Cu (i.e. less than in the other preservatives tested) and 4% Cr oxides being leached in 12 days, previous data confirming the high degree of Cu fixation (>90%) in test blocks

even after 128 days' leaching [see *F.A.* 17 No. 2092]. After air-drying of samples treated with (2) for 21 days, >15% As and 20% Cr oxides were leached out; even so, As-fixation was still better than for (1), while heavy losses of As in other similar preservatives were also noted [see *F.A.* 13 No. 2538]. The results obtained for (7), showed that after 21 days' air-drying, 33.5% of the total salts (excluding H_3BO_3 which was not determined) were leached out, mainly as 55% $ZnCl_2$ since the Cu and Cr oxides remained almost wholly fixed throughout this period. Recommendations are made for improving (7) to achieve better fixation of Zn and B ions.

3730. SHIBAMOTO, T., INOU(Y)E, Y., and KENJO, Y. [Studies on water-borne wood preservatives. XVII. Colour change of treated wood by weathering procedure.] *J. Jap. Wood Res. Soc.* 6 (3), 1960 (122-8). 5 refs. [Jap.jap.e.e.] P.R.

Presents extensive tabulated and graphical data from studies of colour changes caused in wood by weathering, in which test blocks of *Cryptomeria japonica* and *Phyllostachys edulis* were treated with 14 preservatives by dipping (for 5 min.), double-dipping, brushing (twice), or hot-steeping (boiling for 30 min. in *p*-nitrophenol). The colour of *P. edulis* treated with *p*-nitrophenol was greatly changed by exposure to bright light, but with Cu PCP only slight colour changes occurred. Since the colour of *C. japonica* also appears to vary according to grain, figure and annual-ring condition, colour changes through weathering were difficult to measure.

3731. PURUSHOTHAM, A. A short note on the "VeCu" wood preservative. *J. Timb. Dryers' Pres. Ass. India* 5 (2), 1959 (20-3). 4 refs. P.R.

Presents brief preliminary results of tests made to assess the commercial possibilities of a vegetable (*mahwa*)-oil/Cu preservative, "VeCu," in treating *Bambusa arundinacea* and *Dendrocalamus strictus*.

3732. KALNINŠ, A. I., and KALNINJA, Ē. P. Perspektīvy antiseptirovanija drevesiny naftenatami. [Prospects of wood preservation with naphthenates.] *Trud. Inst. Leshoz. Probl., Riga* No. 19, 1960 (207-12). 9 refs. [Russ.russ.] N.L.L.

Oven-dried cubes of Scots Pine sapwood were impregnated under vacuum with solutions of Cu, Cd, Zn, and Ba naphthenates (various concentrations) and exposed to *Coniophora cerebella* for 4 months. Results are tabulated. Cd naphthenate had the best fungicidal effect, and Cu naphthenate was also good. Zn and Ba naphthenate were ineffective, especially the latter. In tests on resistance to leaching, Cu naphthenate was the best, followed by Cd. It is suggested that large-scale trials be made with Cu naphthenate to preserve roofing timbers.

3733. [Preservative treatment of wood in the green state.] *Extr. from Rep. For. Res. Inst. N.Z. For. Serv.* 1958-59, 1960 (42-3).

The possibility of treating 'green-off-saw' and 'green-natural-round' timbers with multi-salt preservatives has been investigated by means of the

oscillating-pressure method (O.P.M.). The most promising species tested was Corsican Pine, posts of which (4.5 in. diam., 6.5 ft. long) were fully penetrated in 8-14 hr. Douglas Fir gave variable results; Larch was unsatisfactory under all conditions. Radiata Pine was satisfactory only when treated at ca. 80% m.c. One of the problems in O.P.M. treatment is control of the chemical concentration of the impregnant, which becomes diluted or contaminated in the course of treating green-off-saw timber. It has been established that the determination of hexavalent chromium provides a simple and reliable method of testing the concentration.

3734. "Wizard" pressure treating plant. *FAO For. Equipm. Note* No. E.22.60, 1960. pp. 1.

Manufactured by the Osmose Wood Preserving Co. of America, Buffalo, N.Y., this is described as a "complete wood-preserving plant in one machine." It can be transported on a single lorry or railway wagon. The only connexions necessary are a water main capable of delivering 10-20 gal./min. and electrical connexions for a 60-cycle, 220/440-volt, 3-phase line.

3735. PURUSHOTHAM, A., PANDE, J. N., and KUREEL, A. P. A preliminary note on the treatment of timber by the hot and cold process in an open tank wherein provision has been made for the application of vacuum and low pneumatic pressure. *J. Timb. Dryers' Pres. Ass. India* 5 (3), 1959 (10-8 + 1 photo). P.R.

Describes the experimental procedure followed in treating a wide range of Indian timbers in an open tank specially modified to allow the application of a vacuum (ca. 20 in. Hg) and of light pressures (15-30 lb./sq. in.). The results obtained showed no material improvement in the penetration of the 50/50 creosote/fuel-oil preservative over the normal hot-and-cold process, though the treatment time, which was ca. 24 hr. for the normal hot-and-cold process, was reduced to ca. 5 hr. when vacuum and pneumatic pressure were used in combination with the hot-and-cold process. The economic advantage of the method, however, is particularly stressed in view of the difficulty of acquiring the more costly pressure equipment in India.

3736. STOUT, A. W. Permatol for railroad ties. *Res. Note West. Pine Ass.* No. 2.311, 1953 (rev. 1960). pp. 2. 3 refs.

Open-tank immersion in 5% solution of PCP in diesel oil is recommended to extend the life of wood used in contact with the ground. Treating times, tank size, costs, etc., are given.

3737. BALON, A. Preservation of wood poles for overhead transmission lines. *Wood* 25 (12), 1960 (489-90). 4 refs.

A review of work by the F.P.R.L., Princes Risborough and the Electrical Research Association, on the creosoting of poles, the relevant British Standards, decay, and after-treatment.

3738. BLEW, J. O., JR., and KULP, J. W. Service records on treated and untreated fence posts. *Rep.*

U.S. For. Prod. Lab., Madison No. 2005 (rev.) 1959. pp. 13 + 2 tbls. 26 refs. P.R.

[Cf. F.A. 16 No. 4683.] Reports on the latest examinations of various post installations, according to the method of treatment used.

3739. SMITH, D. N. R., and COCKCROFT, R. A method of obtaining uniform distribution of wood preservatives in toxicity test blocks. *Nature, Lond.* 189 (4759), 1961 (163-4). 4 refs.

Blocks are cooled below freezing point of the solution directly after impregnation, and the solvent then sublimed off under vacuum.

3740. WAŻNY, J. Badania nad działaniem środków grzybobójczych na grzyby *Coniophora cerebella* Pers. i *Merulius lachrymans* (Wulf.) Fr. [Investigations on the effect of fungicides on *C. cerebella* and *M. lachrymans*] *Folia for. polon. (Drzewn.)* No. 2, 1960 (93-114). 29 refs. [Pol.russ.e.]

Agar-culture and wood-block tests were made to determine the effectiveness of (a) 7 salts, and (b) 12 oily preservatives. Results, tabulated in detail, agree fairly closely with those obtained in Germany [see F.A. 12 No. 1372]. A direct correlation was found between the inhibitory concentration ranges of both (a) and (b) for *C. cerebella* (and of (b) for *M. lachrymans*) as found by agar tests, and those found by wood-block tests.

3741. BECKER, G., and KAMPF, W.-D. Versuche zur Laboratoriumsprüfung der Wirkungsdauer öliger Schutzmittel für Holz im Meerwasser. [Laboratory tests for the duration of effectiveness of oily preservatives in sea-water.] *Materialprüfung, Düsseldorf* 2 (8), 1960 (301-7). 21 refs. [G.g.e.f.e.f.] N.C.L.

Describes tests with *Limnoria tripunctata* on Pine sapwood impregnated with various concentrations of creosote [cf. F.A. 20 No. 5253] to find a reliable accelerated testing method. The specimens, after 4 weeks' conditioning, were kept for 8-48 weeks either in calm air or in a wind tunnel, sea water, distilled water, or combinations of these treatments, at different constant or changing temperatures between 20 and 40° C. Specimens lost resistance faster in a wind tunnel than in calm air, but not so fast as in water. The fastest method—a few weeks in water before or after a few weeks in the wind tunnel—would require an initial dosage of ca. 200 kg. creosote/cu. m. for effective protection after 16 weeks' exposure. This amount corresponds well with retentions provided for in practice.

3742. Proceedings of the Fifth Annual Meeting of the Committee for the protection of timber against marine organism attack, held at Trivandrum on the 7th and 8th in the Kerala University Building and at Ernakulam on the 9th and 10th March, 1960, in the Sacred Heart's College, Thevara; Appendixes I, II, III(a) and III(b). *J. Timb. Dryers' Pres. Ass. India* 6 (2), 1960 (1-22 + 1 plate). P.R.

Includes appended reports by A. Purushotham, mainly outlining the work of Dehra Dun, the Bombay and other Indian wood-preservation centres, on *Limnoria*, *Teredo*, and *Martesia* spp., with particular reference to durability tests on Ascu- and creosote-treated heartwood specimens of Indian timbers, and

by A. S. Rawat, summarizing the results of statistical data on (a) toxicity tests with Ascu, creosote, creosote/fuel-oil, and PCP preservatives, and (b) durability tests on *Adina cordifolia*, *Tectona grandis*, and *Shorea robusta* at various harbours.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

See also No. 3710.

3743. KONDRATOV, L. I. Gruzopod'ernost' sterznej iz pressovannoj drevesiny pri kručenii. [Load capacity of rods of compressed wood under torsion.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (156-9). 3 refs. [Russ.]

An exposition of the theoretical calculations and experimental results in favour of the use of contour-pressed wood [see F.A. 20 No. 1086] in machinery.

3744. ARSUMANJAN [ARZUMANJAN], G. A. [On the swelling pressure of compressed Scots Pine sapwood.] *Doklady Akademii Nauk Armjanskoi SSR, Erevan* 27, 1958 (251-6). [Arm.?] From *abstr. in Holzforschung, Berlin* 14 (5), 1960 (158). [G.] P.R.

[Cf. F.A. 22 Nos. 2473-4.] Samples of Scots Pine were dried at 100° C. and clamped, samples being (a) left unpressed at 20 × 20 × 6 mm., (b) compressed radially from 30 to 20 mm., and (c) compressed radially from 40 to 20 mm. The clamped samples were then stored over a saturated soda solution, and their m.c. measured continuously. The m.c. of (b) and (c) was only slightly below that of (a); the brass clamps began to break after 8-13 days. Samples similarly clamped and compressed, but at their natural m.c., were stored in water; here the m.c. of (b) and (c) was $\frac{1}{3}$ less than that of (a), and the metal clamps did not begin to break until after 41 days. The mean swelling pressure was 483 kg./sq. cm.

3745. HUHRJANSKIJ, P. N. Iznosostojkost' pressovannoj drevesiny i drevesno-sloistogo plastika iz buka. [The abrasion resistance of compressed wood and improved laminwood of Beech.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (102-11). [Russ.russ.]

The abrasive-disk method was used to determine the abrasion resistance (a.r.) of cubes of ordinary compressed wood (i), and of improved laminwood (ii) [cf. F.A. 18 No. 1054]. A.r. was determined in all three planes, and in two directions (at right angles) in each plane; the results are shown in tables and graphs. The density of (i) was 1.1-1.15 g./c.c., and of (ii) 1.35 g./c.c. The anisotropy of the properties connected with abrasion was less evident in (ii) than in (i); (i) was equal or superior to (ii) in a.r. in all planes and directions.

3746. HUHRJANSKIJ, P. N. Iznos i trenie pressovannoj drevesiny berezy. [Abrasion and friction of compressed Birch wood.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (125-35). 3 refs. [Russ.russ.]

Disk abrasion tests were made in all three planes on compressed Birch cubes of edge 15 mm. and density 1.2 g./c.c. Abrasion resistance, friction coefficient, and specific work, all changed with the plane and direction of abrasion relative to the rays. Resistance and specific work decreased, and the

friction coefficient increased, with increasing disk pressure. A close curvilinear relationship was found between the friction coefficient and linear wear, expressed by $U = C\mu^z$ where U = wear; μ = friction coefficient; and C and z are, respectively, 3640 and 4.2 for the end-grain surface; 4270 and 3.75 along the grain; 1870 and 4.7 across the grain.

3747. NAZAROV, I. G. Koëfficient trenija vtulok iz pressovannoj drevesiny. [The friction coefficient of bushes made of compressed wood.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (121-4). 3 refs. [Russ.]

Bushes of internal diameter 60 mm. and length 60 mm. were made of (a) wood compressed in one direction only, and (b) pressed-and-bent wood [cf. *F.A.* 20 No. 2486]. The fibres of the (a) bushes were || to the shaft axis, and those of the (b) bushes ⊥. Friction tests were made on a special machine at pressures of 2-25 kg./sq. cm., at sliding speeds of 0-4 m./sec., and with 3 grades of lubricating oil. Results are tabulated and graphed.

3748. MITCHELL, H. L. New antishrink treatment stabilizes gunstock wood. *Wood, Chicago* 65 (11), 1960 (50, 52, 102). P.R.

Presents brief details and results of dimensional stability tests made on gunstocks of *Juglans nigra*, *Prunus* sp., Bird's-Eye Maple, Oregon Myrtle, *Acacia koa*, *Eucalyptus robusta*, and Hawaiian Curly Mango, by the successful use of a treatment previously described [see *F.A.* 21 No. 3785].

3749. ZENKTELER, M. Metoda stabilizacji oporzwiasciowego w drewnianych elementach łącznic telefonicznych. [A method of stabilizing the wooden parts of telephone kiosks.] *Przegląd Telekomunikacyjny* 30 (4), 1957 (105-9). [Pol.] From *abstr. in Holz Roh- u. Werkstoff* 18 (10), 1960 (404). [G.]

Reports experiments in which small Pine and Beech boards were left for ca. 3 hr. in a sulphur bath at 150° C. The bath temperature was then reduced to 120° in the next 2 hr., and the boards finally removed. Uptake by Pine was 190% of the original oven-dry weight, and by Beech 99%. These, and untreated control boards were then left for 24 hr. in moisture-saturated air at 20°. Moisture uptake of the treated boards was 1% (Pine) and 1.3% (Beech), as against 6% and 4.5% respectively for the untreated controls. The electrical resistance of the treated boards was well over 10,000 megohms, the Polish minimum requirement.

843. Fireproofing and Fire Resistance

See also Nos. 3570, 3726, 3729.

3750. BRUCE, W. E. Fire retardants. *Repr. from Dock & Harbour Authority, London* May, 1960 (33-4). 4 refs. P.R.

Outlines the main qualities necessary for fire retardants, and discusses briefly methods of application, viz. pressure impregnation and surface coating, with suggestions for the choice of treatment and details of costs. The possibilities of combined decay-preservative/fire-retardant treatments are briefly touched upon. [Cf. *F.A.* 21 No. 3772.]

844. Attack by Plant Organisms

See also Nos. 3804-9, 3959.

844.1. Sap-staining and Mould Fungi

See also Nos. 3761, 3806-8.

3751. STOUT, A. W. Storage caused defects in Idaho White Pine logs. *Res. Note West. Pine Ass.* No. 2.112, 1955 (rev. 1960). pp. 4. 3 refs.

Blue-stain was found to be the major degrading factor: 20% of the lumber from a sample of cold-decked logs carried stain, 6% being stained to a point of degrade totalling \$3.60/1000 bd. ft. loss; checking and borer damage increased the loss to \$6.67/1000 bd. ft. The degrade in lumber from the underwater portion of logs bundled in water storage was negligible, but those logs entirely above water suffered blue-stain losses amounting to \$2.60/1000 bd. ft. Bacterial invasion (with accompanying sour log brown stain and over-porosity) was not taken into account.

3752. KRAPIVINA, I. G. Razrušenie gribami sinevy vtoričnogo sloja kletčnoj stenki. [Break-down of the secondary cell wall by bluestain fungi.] *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (130-3 + 2 plates). 11 refs. [Russ.]

Reviews the literature and discusses, with photomicrographs, the destruction of the secondary cell-wall of Scots Pine by several bluestain fungi.

3753. STOUT, A. W. Testing sap stain solution strength. *Res. Note West. Pine Ass.* No. 2.212, 1951 (rev. 1959). pp. 3. 1 ref.

The strength of a fungicidal solution can be readily checked by determining its temperature and its density (apparatus described). The concentration can then be found on a chart for the chemical concerned. Suppliers of checking apparatus, successful commercial fungicides available, and charts for these fungicides are given.

3754. Sugar Pine brown stain. *Res. Note West. Pine Ass.* No. 4.5111, 1937 (rev. 1960). pp. 3. 5 refs.

This revised Research Note replaces Research Notes Nos. 4.5111, 4.5112, and 4.5113. Work on Sugar Pine brown stain, culminating in the development of the buffered NaN_3 dip [cf. *F.A.* 21 No. 3788], is summarized.

844.2. Wood-destroying Fungi

See also Nos. 2791, 3265 *et seq.*, 3627, 3641, 3719, 3740, 3808-9, 3828, 3851, 3859.

3755. LEVY, J. F., and LLOYD, F. J. A study of the fungi present in timbers in Tywarnhale Mine [Cornwall]. *J. Inst. Wood Sci.* No. 6, 1960 (14-25). 18 refs.

To determine the hazard to which ladders were likely to be exposed in a disused copper mine (chosen as a site for service tests), a 4-year study of the fungi present in the underground timbers was begun in 1956. From isolations made in this period, a list of basidiomycetes and microfungi was compiled. The environment underground, the nature of the timbers present (mainly some original *Pinus palustris* members at least 54 years old, a variety of

new untreated, and re-used secondhand, softwoods, and pressure-treated preserved timber, mainly *Pseudotsuga taxifolia*, installed over the last 3-4 years), and the isolation and cultural methods used are described. The results obtained are listed and discussed.

3756. HARMSSEN, L. Taxonomic and cultural studies on brown spored species of the genus *Merulius*. *Friesia*, København 6 (4), 1960 (233-77). 42 refs. [E.e.] P.R.

Examination of herbarium specimens and culture experiments showed that *M. lacrymans* and *M. himantioides* are distinct species. *M. americanus*, *M. brassicaefolius* and *M. silvester* are considered synonyms of *M. himantioides*. *M. pinastri* is distinct from *M. tignicola*. A new variety, *M. lacrymans* var. *shastensis* var. nov. is proposed.

3757. McNABB, H. S., Jr. Procedures for laboratory studies on wood decay resistance. *Proc. Iowa Acad. Sci.* 65, 1958 (150-9). 29 refs. L.S.

Presents a summary of recommended techniques (based mainly on literature from the U.S.A.) for the preparation of test wood, test fungi and decay chambers, the exposure of specimens to test fungi, the care of specimens after exposure to test fungi, and the computation of data.

3758. COWLING, E. B., and SACHS, I. B. Detection of brown rot with osmium tetroxide stain. *For. Prod. J.* 10 (11), 1960 (594-6). 2 refs.

A 1% (weight/volume) aqueous solution of OsO_4 produced a dark stain in <5 min. on specimens of Southern Pine, Sitka Spruce and Sweetgum infected with brown-rot fungi, but took >20 min. to stain sound wood or wood infected with white rot. Incipient decay by *Poria monticola* (2% weight loss) reacted as fast as severe decay (70% weight loss). The reagent was also successful in the field, with many species, in distinguishing brown from white rot, bluestain and reaction wood. The sapwood of 59 softwoods and 101 hardwoods reacted in >20 min., but the heartwood of 5 softwood and 52 hardwood species in <5 min. A method for preparing and applying the solution of this highly toxic substance is described.

3759. COWLING, E. B. Methods for chemical analysis of decayed wood. *Rep. U.S. For. Prod. Lab., Madison* No. 2177, 1960. pp. 24 + 1 drawing, 1 dgm., 1 tbl. 10 refs. P.R.

Describes the analytical methods developed by the author to study the comparative biochemistry of the decay of *Liquidambar styraciflua* sapwood by *Poria monticola* and *Polyporus versicolor*. The modifications made to the standard methods of analysis for sound wood (which differs from decayed wood in resistance to fragmentation during grinding, in hygroscopicity, and in solubility, filtration, and surface properties), potential sources of error in the results and their interpretation, and precautions considered desirable in the interests of reproducibility, are discussed.

3760. GLASER, T., ŁAWNICZAK, M., and SPŁAWA-NEYMAN, S. Wpływ parowania drewna bukowego na jego rozkład przez grzyb *Polystictus versicolor*

(L.) Fr. [The effect of steaming on *P. versicolor* decay in Beech.] *Prace Inst. Tech. Drewna* 5 (1), 1958 (37-45). 5 refs. [Pol.pol.russ.e.] P.R.

Samples of freshly cut Beech were steamed for 1, 2 and 3 hr. at 0, 1, 2 and 3 atm. and then infected with *P. versicolor*. Neither the duration nor the pressures of treatment had any significant effect on the resultant decay.

3761. FREJDIN, A. S., and KRAPIVINA, I. G. Sterilizacija drevesiny s pomoščju ionizirujuščej radiacii. [Sterilizing wood with the aid of ionizing radiation.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (117-20). 9 refs. [Russ.]

[Cf. F.A. 21 No. 2447.] Scots Pine samples, $20 \times 2 \times 2$ mm., attacked by *Trichoderma lignorum*, *Discula brunneo-tingens*, *Stereum sanguinolentum* and *Corticium laeve*, were subjected to doses of 0.08, 0.175, 0.35 and 0.45 M. rad, using γ rays from a Co^{60} source. The mycelia of all four fungi survived doses ≤ 0.35 M. rad, but were killed by 0.45 M. rad. In further experiments, subjecting pure cultures of 33 different species of fungi to doses of 0.175, 0.27, 0.35, 0.45 and 0.54 M. rad, susceptibility varied considerably. The only fungi killed by 0.175 M. rad were *Aspergillus candidus*, *Phialophora fastigiata*, *Lenzites saepiaria*, *Lentinus lepideus*, *Coniophora cerebella*, *Poria vaillantii*, *P. vaporaria*, *Merulius pinastri*, and strain 152. Species surviving 0.35 M. rad were *Penicillium meleagrinum*, *Verticillium glaucum*, *Trichoderma lignorum*, *Ophiostoma comatum*, *Alternaria humicola*, *D. brunneo-tingens*, *Corticium laeve*, *Stereum hirsutum*, *S. sanguinolentum*, *Polystictus abietinus*, *P. zonatus*, *Schizophyllum commune*, *Lenzites betulina* and *Poria obliqua*. The only fungus to survive 0.54 M. rad was *Alternaria humicola*. Parallel work with wood-destroying insects is briefly referred to, and it is thought that a dosage lethal to all fungal and insect pests of timber would be ca. 1 M. rad, while damage to wood properties by radiation does not start until doses of 50 M. rad are reached.

3762. Wood decay in houses. How to prevent and control it. *Home and Garden Bulletin*, U.S. Department of Agriculture, Washington No. 73, 1960. pp. 17.

Replaces *Fmrs' Bull.* U.S. Dep. Agric. No. 1993 [cf. F.A. 10 No. 645] as regards decay control.

3763. Dry rot in buildings. Recognition, prevention and cure. *Leaflet. For. Prod. Res.*, Lond. No. 6 (rev.) 1960. pp. 11. Price 1s. P.R.

Describes the characteristic appearance of *Merulius lacrymans*, *Poria vaillantii* and *Coniophora cerebella*, and their effects on wood, and briefly outlines preventive measures in new and existing buildings, with suggestions for control treatment where decay has already begun.

845. Attack by Animals

See also Nos. 3641, 3959.

845.1. Marine Borers

See also Nos. 3720, 3741-2, 3804.

3764. NAGABHUSHANAM, R. A note on the inhibition of marine wood-boring molluscs by heavy

fouling accumulation. *Sci. & Cult.* 26 (3), 1960 (127-8). 2 refs. E.M.B.

Two deal panels, 6 × 6 in., were exposed one foot below low water for 3 months in Visakhapatnam harbour, one panel scraped clean of fouling, weekly. *Martesia striata*, *Teredo furcillatus*, and *Bankia campanellata* numbered 83, 96 and 45 in the clean and 6, 15 and 4 in the fouled piece.

3765. NAGABHUSHANAM, R. **Resistance of Indian timbers to attack by marine borers.** *J. Timb. Dryers' Pres. Ass. India* 6 (1), 1960 (1-13 + 8 photos). 41 refs.

Presents the results of tests in which 80 Indian timbers were examined at monthly intervals (Jan.-Aug. 1956) for natural resistance to attack by *Martesia* and *teredo* in Visakhapatnam harbour. None was fully free from attack by all the marine borers, the most significant finding being the total freedom from teredo attack of *Dysoxylum binectariferum*, though it suffered moderate *Martesia* attack during its 8 months of immersion.

3766. SRINAVASAN, T. K. **On a new species of wood boring isopod, *Exosphaeroma madrasensis* from Madras.** *J. Timb. Dryers' Pres. Ass. India* 5 (3), 1959 (20-4). 8 refs. P.R.

Describes a new crustacean wood borer from the E. and W. sea coasts of India, with brief taxonomic observations.

3767. BECKER, G., and KAMPE, W.-D. **The wood-destroying isopod genus *Limnoria* at the continental coast of India and description of *Limnoria indica* sp. n.** *J. Timb. Dryers' Pres. Ass. India* 5 (1), 1959 (12-7). 14 refs. P.R.

Originally published in German [see F.A. 21 No. 5058], this paper includes additional detailed notes on *L. indica*, its taxonomy and habitat.

845.2. Terrestrial Borers

See also Nos. 3092, 3377, 3394-5, 3751, 3804.

3768. **The death-watch beetle.** *Leaf. For. Prod. Res., Lond.* No. 4 (rev.) 1959. pp. 9. 11 refs.

Xestobium rufovillosum: description, with brief reference to its position among British anobiids; life history; damage caused (slight in standing trees—mainly Oak—but serious and widespread in hardwood structural timbers in old buildings), and recognition of attack; remedial treatments and preventive measures. A short bibliography of works giving further information on this and other insects attacking timber, their life history and control, is included.

3769. DOMINIK, J. **Uwagi o *Priobium carpini* Herbst i *Xestobium rufovillosum* Deg. (Col. Anobiidae), dwóch mało znanych szkodników budowli. [*P. carpini* and *X. rufovillosum*—two little-known pests of wood in buildings.] *Sylvan* 104 (9), 1960 (45-9). 5 refs. [Pol.russ.e.]**

Short notes on their occurrence and the damage they cause in Poland.

3770. BLECHLY, J. D. **The susceptibility of hardwoods to *Lyctus* powder-post beetles and methods of control [with discussion].** *Report, 7th*

Commonwealth Entomological Conference, London 1960 (97-103). 59 refs.

A review and discussion of literature on the biology and methods of control of these beetles.

3771. JONES, T. **Ambrosia beetle research in West Africa.** *Report, 7th Commonwealth Entomological Conference, London* 1960 (88-97). 8 refs.

A review of work in West Africa, and of fundamental studies on ambrosia-beetle biology at the Forest Products Research Laboratory, Princes Risborough. [Cf. F.A. 21 Nos. 1130-1.]

3772. BRY, R. E., McDONALD, L. L., and DAVIS, D. F. **Preliminary evaluation of lindane and heptachlor crystals for protection of crated furniture against insect damage.** *J. econ. Ent.* 53 (5), 1960 (966-7). 2 refs.

Crates, more or less airtight, had suspended in them: 4 muslin bags of loose crystals of (a) lindane or (b) heptachlor or, on ceiling and walls, paper with adherent crystals of (c) lindane or (d) heptachlor, all treatments at 8 g./cu. ft. of crate. The % of dead and dying test insects after exposure to the freshly applied poisons and in a second test 42 days later, showed (c) and (d) to be equally effective, and superior to (a) and (b), with (b) more toxic than (a).

845.3. Termites

See also Nos. 2721, 3804.

3773. HARRIS, W. V. **Observations on the termites which damage constructional timbers.** *Report, 7th Commonwealth Entomological Conference, London* 1960 (103-6). 2 refs.

Discusses the practical importance of a knowledge of the taxonomy, morphology, ecology, etc., of termite families, genera and species (reflected in, e.g., tolerance of various chemical poisons) in planning control and prevention.

3774. SCHULTZE-DEWITZ, G. **Form und Intensität des Termitenangriffes an Hölzern verschiedener Struktur und Rohdichte—Zweite Mitteilung: Prüfungen von Hölzern mit verschiedener Jahrringbreite und verschiedenem Spätholzanteil. [The manner and severity of termite attack on wood of different structure and density. II. Tests with wood of different ring width and different late-wood %.] *Holz Roh- u. Werkstoff* 18 (11), 1960 (413-5). 3 refs. [G.g.e.] P.R.**

[Cf. F.A. 22 No. 2502.] Tests made with *Reticulitermes lucifugus* on heartwood of *Picea abies*, *Pinus sylvestris* and *Quercus robur* showed that the intensity of attack was less in narrow- than in broad-ringed material, was not affected at all by the late-wood %, and was influenced only a little by mean end-grain hardness.

3775. MATHUR, R. N., and SEN-SARMA, P. K. **Notes on the habits and biology of Dehra Dun termites. (Part 1.) *J. Timb. Dryers' Pres. Ass. India* 5 (3), 1959 (3-9 + 2 plates). 1 ref. P.R.**

Describes briefly the topography of the area concerned, viz. the town of Dehra Dun, and discusses the distribution, biology and economic significance of *Angulitermes dehraensis*, *Coptotermes*

heimi, *Heterotermes indicola* and *Neotermes bosei*, indicating the nature and extent of the damage caused to a wide range of Indian timbers.

3776. MATHUR, R. N., and SEN-SARMA, P. K. Notes on the habits and biology of Dehra Dun termites. (Part 2.) *J. Timb. Dryers' Pres. Ass. India* 6 (2), 1960 (23-7 + 1 plate). 14 refs. P.R.

[Cf. preceding abstr.] Discusses briefly the distribution, biological data, and economic importance of *Capritermes dunensis*, *Eremotermes dehraduni*, *Microtermes beesonii*, *M. anandii*, *M. unicolor*, *Neotermes megaoculatus megaoculatus*, *N. microculatus* and *Nasutitermes thanensis*.

3777. HICKIN, N. A record of accidental importation. *Timb. Technol.* 69 (2259), 1961 (26-7). 8 refs.

Records an instance of accidental importation of *Cryptotermes brevis* into England from Trinidad, in the wood and plywood of a portable gramophone case. The five known instances of accidental importation of Isoptera into England since 1874 are listed.

3778. How Hawaii combats tropical termites. *Wood Pres. News* 38 (11), 1960 (20 ... 24). P.R.

Alludes briefly to the service records, from ca. 1932, for structural timber (mainly Douglas Fir) and plywood in Hawaii, indicating the extent of damage caused by *Coptotermes formosanus*, and discussing the effectiveness of the various preservative treatments in current commercial use.

846. Steaming

See also Nos. 3760, 3784.

3779. ŁAWNICZAK, M. Investigations on (creep) deformations and stress relaxation in steamed Beech wood. *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4395, 1959. pp. 9 + 4 sets of gphs., 3 tpls. 7 refs. Transl. by A. Stashevski from *Prace Inst. Tech. Drewna* 5 (1), 1958 (61-81). [See F.A. 22 No. 1141.] Limited distribution.

847. Drying (Seasoning)

See also Nos. 3145, 3576, 3712, 3818.

3780. Sun's rays harnessed to dry lumber. *Sth. Lumberm.* 201 (2511), 1960 (32).

A preliminary account of a "solar-heated pre-dryer", under development at Madison, essentially a small shed of corrugated aluminium painted black, with the roof and sides enclosed in two layers of plastic sheeting kept 2 in. apart, forming a heat trap. An automatically controlled fan is installed near the roof. An experimental charge of 425 bd. ft. of Red Oak was dried to 20% in 29 days, whereas open-air controls took 65.

3781. HOWARD, H. P. Stickless air drying. *Wood* 26 (1), 1961 (26).

Describes and illustrates the method (often used in Europe), which is suitable for thin, uniform pieces > 2 ft. long, and which requires stickers only at the ends of the stack, the pieces of timber being supported interiorly by their overlapping ends.

3782. HERMANN, A. Air drying of lumber in unit packages. *Res. Note West. Pine Ass.* No. 4.111, 1951 (rev. 1959). pp. 12. 1 ref.

Explains the relationship of heat, humidity and air circulation to unit package size and placement in the air-drying yard. Such factors as stack width, height, spacing, sticking, alignment, etc., are discussed, with recommendations for a typical yard lay-out, giving foundation details and variable spacing for summer and winter. From author's summary.

3783. HERMANN, A. A reversible circulation air drying yard. *Res. Note West. Pine Ass.* No. 4.121, 1952 (rev. 1960). pp. 4.

In a 24-hour study of air circulation in calm conditions in a timberyard at Redding, Calif., readings of air temperature, r.h., and velocity and direction of clouds of smoke were taken hourly at 3 points. It was found that the air reversed its direction twice, rising in the yard at night and at other times descending. The reasons for this, its effect on lumber, and implications for yard lay-out, are discussed.

3784. SOBCZAK, K. Wpływ sezonowania na wyniki parowania bukowych łat meblowych i suszenia wygiętych elementów. [Effect of seasoning on the steaming of Beech furniture laths and on the drying of bent members.] *Folia for. polon. (Drzewn.)* No. 2, 1960 (37-92). 79 refs. [Pol.russ.e.]

Investigates the changes in moisture content during the air seasoning of Beech furniture laths (32 × 40 and 26 × 26 mm. in cross-section) and rods (23 mm. diam.) cut and stacked in Jan., April, and Oct. 1956 until June 1957, and also the effect of this air seasoning on the steaming (and bending) and subsequent kiln-drying of the members. Members stacked on all three dates reached ca. 12% m.c. by June 1957, irrespective of cross-sectional dimensions. The optimum m.c. of pre-seasoned members destined for steaming is >20%. A graph is presented which enables determination of the time necessary for air seasoning. Air seasoning before steaming and bending is a perfectly suitable procedure in the production of dark-coloured furniture, and an essential one in the production of the more valuable light-coloured furniture.

3785. KNIGHT, E. The need for segregation: drying mixed charges. *Res. Note West. Pine Ass.* No. 4.212, 1953 (rev. 1959). pp. 6.

A discussion of methods of segregation by species, thickness, grade, etc. Recommendations include: preliminary sorting of logs into species; restriction of number of thicknesses cut at one time; sorting and drying green lumber according to its drying rate rather than by grade or width, afterwards using a rough dry sorter to separate into widths, lengths, and grades. Methods of drying more than one sort in one schedule (e.g. by removing one charge half-way through) are proposed.

3786. KNIGHT, E. The identification of White Fir drying sorts. *Res. Note West. Pine Ass.* No. 4.213, 1955 (rev. 1960). pp. 5.

Notes the characteristics of (a) sapwood, (b) sinker (heavy heartwood), and (c) corky (light

heartwood). With limited sorting, (a) can be dried with (c), but (b) should always be dried separately.

3787. KNIGHT, E. **Suggestions for dry kiln roof construction.** *Res. Note West. Pine Ass.* No. 4.226, 1960 (rev. 1960). pp. 7.

Many dry kilns have unusually short lives, the major cause being moisture accumulating within the structure. Recommendations are made in the light of the performance of dry kilns to which newly developed and improved roof-construction techniques have been applied.

3788. HERMANN, A., and RASMUSSEN, C. A. **Dry kiln fans.** *Res. Note West. Pine Ass.* No. 4.224, 1942 (rev. 1960). pp. 2. 3 refs.

3789. REHMAN, M. A., GHOSH, D. P., and MEHRA, M. L. **Design and operation of an improved type of indirect-heated thermal-circulation furnace kiln.** *Indian For. Bull. (n.s.)* No. 226, 1960. pp. 10. 8 refs.

Describes the constructional details and results obtained with an indirect-heated, thermal-circulation type of furnace kiln developed at Dehra Dun, having improved air circulation, simple humidifying arrangements and considerably reduced fire risk. The kiln has been found suitable for seasoning moderately heavy hardwoods for furniture manufacture and general carpentry. Packing-case timbers can also be successfully seasoned by adopting suitable methods of stacking. Steam and electric power are not required. Off-cuts of logs and other forms of wood fuel are used for supplying heat, and a little water is needed for humidification. The operation of the kiln is very simple. The initial cost and the recurring expenses are much less than those of a steam-heated kiln. The quality of drying is reasonably good. The kiln is particularly suitable for small-scale industries. The results obtained with several species of timber are reported. *From authors' summary.*

3790. MIKIT, Ė. A., and UPMANIS, K. K. *t, y*-diagramma. [The *t, y*-diagram.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (13-8 + 1 dgm.). 1 ref. [Russ.] N.L.L.

Describes the use of the diagram (constructed with an oblique-angled system of co-ordinates, the co-ordinates being *t*, the temperature of the drying agent (steam) in °C., and *y*, the air content of the steam) in timber-drying technology, using steam temperatures >100° C.

3791. MIKIT, Ė. A., and UPMANIS, K. K. **Novye konstruktivii kamer dlja suški pilomaterialov.** [New designs of kilns for drying sawn timber.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (19-25 + 1 set of dgms.). [Russ.] N.L.L.

Presents and discusses the design drawings of two Latvian compartment kilns for super-heated steam drying.

3792. MALMQUIST, L., and NOACK, D. **Studies on drying sensitive hardwoods in pure superheated steam (unsaturated water vapour) at low pressures.** *Transl. For. Prod. Lab. Can.* No. 138, 1960. pp. 20.

Transl. from Holz Roh- u. Werkstoff 18 (5), 1960 (171-80). Limited distribution. [See F.A. 22 No. 1147.]

3793. KNIGHT, E. **Elevated kiln temperatures for the associated species [in the Western Pine region].** *Res. Note West. Pine Ass.* No. 4.215, 1959. pp. 10. 1 ref.

In seasoning experiments with Douglas Fir, Larch, White Fir and Engelmann Spruce, 3 temperature levels were used. Conventional temperature schedules gave slowest drying. Temperatures up to 210° F., near the upper limits practical for existing kiln equipment, gave increased drying speed with good quality. Temperatures above 212° gave the greatest drying speed, but involved limitations in kiln construction and increased lumber defects that would prevent their general use in the Western Pine region.

3794. HERMAN[N], A., and RASMUSSEN, C. [A.] **Some factors affecting rate of airflow in Western Pine dry kilns.** *Res. Note West. Pine Ass.* No. 4.223, 1940 (rev. 1959). pp. 8. 2 refs. [Cf. Hermann and Rasmussen, F.A. 2 p. 59.]

3795. HERMANN, A., and RASMUSSEN, C. A. **Rate of drying of Western Pines as related to rate of air circulation in the kiln.** *Res. Note West. Pine Ass.* No. 4.221, 1938 (rev. 1960). pp. 28.

3796. McMILLEN, J. M. **Special methods of seasoning wood.** *Chemical seasoning. Rep. U.S. For. Prod. Lab., Madison* No. 1665-6 (rev.) 1960. pp. 4. 6 refs. P.R. [Cf. F.A. 18 No. 4727.]

3797. **Prevention and cure of defects in kiln dried wood.** *Tech. Bull. Furniture Developm. Coun.* 9 (47), 1960 (225-6). P.R.

Lists the causes, and methods of prevention and cure, of the following defects: case-hardening; surface-checking; uneven drying; warping, twisting and cupping; honeycombing; collapse; end splitting; mildew and mould; and blue, brown and red stain.

3798. ELLWOOD, E. L., *et al.* **Effect of drying conditions and certain pretreatments on seasoning stain in California Redwood [*Sequoia sempervirens*].** *For. Sci.* 6 (4), 1960 (315-30). 2 refs.

The intensity and extent of this stain, due to the deposition of heartwood extractives at the surface as the board dries, are affected (in order of importance) by the total extractive content, green moisture content, length of storage of green cants and lumber, and least by drying conditions. Each of these factors is studied in detail. Heat treatment before both air and kiln drying markedly reduced the stain, but its long-term efficacy is not yet proven.

3799. BRYAN, E. L. **Collapse and its removal in Pacific Madrone [*Arbutus menziesii*].** *For. Prod. J.* 10 (11), 1960 (598-604). 14 refs.

Reconditioning treatments in steam at 212° F. resulted in excellent recovery from severe collapse and warping of boards dried experimentally at 160 and 180°. Data on radial and tangential shrinkage and recovery are given for flat- and quarter-sawn

boards with normal or (unfavourable) red heartwood, for various moisture contents and treatments. [Cf. *F.A.* 21 No. 3814.]

3800. Kiln drying to prevent bleeding of pitch. *Res. Note West. Pine Ass.* No. 4.211, 1932 (rev. 1960). pp. 6.

It was concluded from trials at Portland, Ore., with different kiln treatments, that Ponderosa Pine stock dried at $\geq 160^\circ$ F. will not exude resin under any normal use. Stock dried at $120\text{--}130^\circ$ may bleed freely if exposed to summer sunlight, and at $140\text{--}150^\circ$ may bleed occasionally under severe exposure.

3801. PETERSON, R. E. Pitch setting by use of radio frequency energy. *Res. Note West. Pine Ass.* No. 3.151, 1957 (rev. 1960). pp. 3.

In a study to determine the possibility of using R.F. energy to set the resin in Ponderosa Pine, ca. 100% setting was obtained with R.F. treatment producing an over-all temperature of 180° F. A $3 \times 4 \times 12$ -in. sample reached this temperature in 2 minutes while passing through a toroidal electrode. Preliminary studies indicate that the cost of processing lumber, using a resin-setting R.F. generator, would be $\$7.50\text{--}12.00/1000$ bd. ft.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 3751, 3813, 3837.

3802. WALTERS, E. Sawmill log handling study. *Res. Note West. Pine Ass.* No. 6.211, 1958 (rev. 1960). pp. 4. 1 ref.

Summarizes results of a study of the relative merits and costs of various methods of log handling at the sawmill. In particular, conventional pond plus crane handling is compared with complete dry handling using wheeled tractor equipment.

3803. ANDERSON, J. C. Stacking hoist for unit packages. *Res. Note West. Pine Ass.* No. 6.3112, 1956 (rev. 1960). pp. 7.

Describes, with diagrams, inexpensive equipment designed to ensure sticker alignment and reduce labour in stacking timber for seasoning.

3804. PURUSHOTHAM, A., SEBASTIAN, V. O., and GROVER, P. N. A preliminary note on the protection of timber logs from splitting and deterioration by insects, termites, marine borers and fungi for short periods during transit and storages. *J. Timb. Dryers' Pres. Ass. India* 5 (4), 1959 (15-9 + 2 photos). 4 refs. P.R.

Discusses the difficulties arising from the adoption of previously recommended protective measures that involved the barking of logs [see *F.A.* 13 No. 2566] and the subsequent appearance of surface splits and cracks, and suggests measures for surface- and end-coating of logs and bolts with [mainly] commercial bituminous materials incorporating creosote. Details of the costs of the materials and operations involved are given.

3805. GYÖRFI, J. A rakodókon tárolt rönkanyag fertőzöttsége. [Insect and fungus damage to logs in timber yards.] *Erdő* 8 (6), 1959 (233-7 + smries. in suppl.). [Hu.russ.g.]

Lists the insects and fungi identified from a dozen yards. Recommends the immediate barking of softwoods, the earlier conversion of native and Turkey Oak, and the speedier removal of all logs to air-drying stacks in yards. The latter, however, are generally unable to accommodate increased stocks.

3806. STOUT, A. W. Log storage practices. *Res. Note West. Pine Ass.* No. 2.115, 1957 (rev. 1960). pp. 4. 4 refs.

A summary of log storage studies showing that savings of $\$0.77\text{--}17.73$ per 1000 bd. ft. can be achieved by improving storage conditions. Information obtained is reviewed. Sprinkling is recommended to provide relief from sour log brown stain and overporosity in Pines.

3807. STOUT, A. W. The storage of Ponderosa Pine and Sugar Pine logs. *Res. Note West. Pine Ass.* No. 2.113, 1955 (rev. 1960). pp. 2.

Water-stored and bundled Ponderosa and Sugar Pine logs withstood summer-long storage with little loss from blue-stain. Bundling was found to double pond storage capacity, speed unloading, prevent sinker losses and reduce breakages.

3808. CRANE, T. P., JR., and FASSNACHT, D. L. Summer storage of hardwood chips at Pensacola, Fla. [with an appended report on the determination of the micro-organisms occurring in the piles]. *Tappi* 43 (12), 1960 (188.4-194.4). 2 refs. P.R.

Presents tabulated results of trials (begun in July, 1959) in which the outside summer storage of two separate piles of (a) Oak, and (b) [unspecified] Gum, chips was studied. After initial oven-drying of the chips in both piles at 104° C., observations made of m.c. and sp. gr. changes over a 3-month period indicated that the monthly loss of wood substance was ca. 1.4% for (a) and ca. 2.5% for (b). Pulp tests revealed no loss in % yield in either case, but the loss in pulp strength amounted to ca. 2% for (a) and 3% for (b). Details of the simultaneous determination of the micro-organisms present in the piles are embodied in a brief appended report by A. F. Verrall, and a table indicating the development of various moulds and fungi, bacteria and yeasts is given.

3809. ROTHROCK, C. W., JR., SMITH, W. R., and LINDGREN, R. M. The effect of outside storage on Slash Pine chips in the [U.S.] South. *Tappi* 44 (1), 1961 (65-73). 11 refs. P.R.

[Cf. preceding abstract.] Potential merits of outside storage of pulpwood chips include better wood measurement, lower handling costs, stabilized chipping and wood-yard operations, and solution of storage problems arising from increased use of sawmill residues, mixed species, and establishment of chip mills at the wood source. In June 1959 at Fargo, Ga., a 10-ft.-high test pile of Slash Pine chips was built on a 100×50 -ft. asphalt base, and monthly samples were taken for moisture and sp. gr. determinations, the identification of decay organisms, and evaluations of pulping. Temperatures within the pile increased by as much as 60° F. in the first weeks and remained above ambient levels. A drying

cycle in the piles was followed by an increase in moisture to abnormal levels. After 2 months' storage, dark staining (a soft-rot attack apparently caused by an *Alternaria*-like fungus) was evident, becoming prevalent in about half the chips after 5 months. Sp. gr. losses amounted to 1-1.5% per month (i.e. no greater than normally observed for roundwood). There was no loss in % yield nor change in permanganate number with storage time, and the 5% loss per month in tear strength was comparable to that for roundwood, thus indicating the feasibility of outside storage in the south.

3810. HICKMAN, L. **Protection of lumber for exterior storage.** *Res. Note West. Pine Ass.* No. 6.711, [n.d.], pp. 4.

Describes 12-month tests on packages of No. 4 Ponderosa Pine common of equal initial moisture content stored out of doors and covered with (a) wet-strength kraft paper laminated with asphalt and reinforced with fibre, (b) black 4 mil polyethylene film, and (c) similar to (a) but with standard-quality kraft paper. Mean lumber m.c. did not change more than 2.5%, even in very wet weather. When auxiliary caps or two thicknesses were used to cover the top, (a) and (c) gave satisfactory protection for one year; (b) stood up well to cool wet conditions, but broke down during hot weather. Costs and wrapping methods are given. In further tests now in progress, an asphalt laminant with an outer coating of (b) shows particular promise, and may be suitable for use as a single layer. [Cf. *F.A.* 17 No. 3421; 19 p. 633.]

85. Grading of Wood and Wood Products

851. Timber Quality in General

See No. 2941.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 3587, 3598, 3797-3801.

3811. IJÁSZ, E. **Needle trace ["ranura"] and embedded cone ["cuenca"] in Radiata Pine.** New Zealand Forest Service, Wellington. [n.d.] pp. 8 + 6 photos, 2 dgms. Transl. from *Carib. For.* 20 (1/2), 1959 (52-7). [See *F.A.* 21 No. 5095.] Limited distribution.

3812. KNIGGE, W., and SCHULZ, H. **Investigations of methods for determining spiral grain in different age zones in hardwood.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4755, 1960. pp. 21 + 2 photos, 5 drawings, 6 gphs. 13 refs. Transl. by M. Harkins from *Holz Roh- u. Werkstoff* 17 (9), 1959 (341-51). Limited distribution. [See *F.A.* 21 No. 2510.]

3813. ARO, P. **Sydänhalkeamat vaneritukeissa ja sorvipölkäissä.** [Heart shakes in veneer timber and lathe logs.] *Metsät. Aikak.* 1960 (12), (437-8, 442). [Fie.]

When Birch is cross-cut, heart shakes appear in the cut face immediately. Shakes are fewer and smaller in trees summer-felled and left to season with crowns intact than in those felled in winter.

Shakes cause least damage when the raw material is stored in long lengths, soaked in tepid water and barked.

3814. LOGAN, H. A., and BRICE, D. C. **Blanking to reduce cup split.** *Res. Note West. Pine Ass.* No. 5.312, 1955 (rev. 1960). pp. 6. 3 refs.

Cup split on mill-run stock can occur on up to $\frac{1}{4}$ of the total volume of lumber surfaced. Half of this splitting is usually severe enough to result in down-grading. Studies show that >\$4/1000 bd. ft. can be saved when selected cupped material is blanked [pre-planed—cf. *F.A.* 17 No. 2019]. The causes of cupping, and the method of preventing cupped lumber from splitting, are described. Results are presented from tests of the value of blanking. *From authors' summary.*

3815. HERMANN, A. **Crooked lumber.** *Res. Note West. Pine Ass.* No. 4.5221, 1938 (rev. 1960). pp. 8

Appeared previously (in 1938) as Research Laboratory Note No. 13. The principal causes of warping of lumber in the Western Pine territory are discussed. Internal or 'natural' factors, where warping results from differences in shrinkage, are distinguished from external factors causing warping in kiln, yard, or sheds, such as poor stacking, bad sawing, undue changes in moisture content, etc.

853. Grading of Wood in the Rough

See No. 3523.

854. Grading of Converted Timber

See also Nos. 3523, 3702.

3816. WOOD, L. W. **Selecting farm framing lumber for strength.** *Leaflet. U.S. Dep. Agric.* No. 481, 1960. pp. 5. 2 refs. Price 5 cents.

Presents rules, based on knots, grain variation, rot, growth rate and size variation, for selecting 2-in. ungraded timber of a variety of species.

3817. JENKINS, J. H. **Grade marking of Canadian lumber for export to the U.S.A.** [Mimeo.] *For. Prod. Lab. Can.* No. 0-183, 1960. pp. 10.

An amplification of a previous work [see *F.A.* 22 No. 2529], with facsimiles of the grade marks.

3818. SNODGRASS, J. D. **Statistical approach to working stresses for lumber.** *Proceedings of the American Society of Civil Engineers, Ann Arbor, Mich.* 85 (ST2), 1959 (9-43). 15 refs. P.O.

Presents results of a study on bending, compression and tension strengths of two grades of Douglas-Fir unseasoned timber, and includes data on the effect of seasoning and of altering the composition of grades by minor modifications of grade specifications.

86. **Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood**

3819. **Voprosy lesohimii i himii drevesiny.** [Problems of forest chemistry and wood chemistry.] *Trud. Inst. Lesohoz. Probl., Riga* No. 12, 1957. pp. 281. Many refs. [Russ.russ.] N.L.L.

A collection of 27 papers, including: Modern

views on the structure of cellulose and the plant cell-wall (P. N. Odincov); Swelling of Spruce cellulose in water and concentrated H_2SO_4 in the presence of sugars (P. N. Odincov); Swelling of Spruce holocellulose in water and concentrated H_2SO_4 in the presence of sugars (P. N. Odincov); Change in the shape of holocellulose fibres during swelling, in relation to biostreatment (P. N. Odincov); Swelling of wood (P. N. Odincov); Swelling of Spruce wood and its components in $HClO_4$ (N. F. Muraščenko and P. N. Odincov); Cooking hardwoods and straw into pulp with hydrotropic solutions (V. S. Gromov and P. N. Odincov); Hydrotropic cooking of Aspen wood, and the effect of various factors on it (V. S. Gromov and P. N. Odincov); Tapping trials on Scots Pine with ribbed faces (A. I. Kalnin's and E. A. Rupajis); Thermal breakdown of hemicellulose from conifers (V. N. Sergeeva and G. E. Domburg); Change in the nature of fibres of Poplar holocellulose under thermal treatment (V. N. Sergeeva and S. V. Miljutina); Chlorination of wood resins to obtain preservatives for wood protection (N. A. Ėrmuš); and The effect of environmental conditions on the composition of wood of the shoots of fast-growing *Populus trichocarpa* (L. N. Možejko and V. N. Sergeeva).

3820. Voprosy gidroliza, himii drevesiny i lesohimii. [Problems of hydrolysis, wood chemistry and resin chemistry.] *Trud. Inst. Lesohoz. Probl., Riga* No. 17, 1959. pp. 157. Many refs. [Russ.] N.L.L.

A collection of 23 papers, three of which have already been noticed [see *F.A.* 21 Nos. 4931-2, 5030], and also including: The hydrolysis of wood with concentrated H_2SO_4 in a semi-production unit (P. N. Odincov, V. K. Kal'nina and C. A. Sobolevskij); The breakdown and hydrolysis of cellulose-containing materials with small quantities of concentrated H_2SO_4 (I. I. Bejnart and P. N. Odincov); Technological principles of the hydrolysis of cellulose-containing materials with small quantities of concentrated H_2SO_4 (P. N. Odincov, A. I. Kalnin's and I. I. Bejnart); The participation of monoses in lignin formation in the living plant (Z. N. Krejberg and V. N. Sergeeva); Some features of the hydrotropic method of obtaining cellulose, and ways of improving it (V. S. Gromov and P. N. Odincov) ["hydrotropism" is the phenomenon whereby aqueous solutions of certain salts dissolve substances not easily soluble in water much better than pure water]; Antiseptic properties of chlorinated resin from the gasification of hardwoods (A. I. Kalnin's, N. A. Ėrmuš and O. K. Bremere) [cf. *F.A.* 21 No. 5030]; and Intensification of wood pyrolysis in retorts with external heating (Ja. A. Surna and P. P. Strejpa).

3821. KAL'NINA, V. K. Gidroliznaja i lesohimičeskaja promyšlennost' Kitajskoj Narodnoj Respubliki. [The hydrolysis and wood-chemistry industries in the Chinese People's Republic.] *Trud. Inst. Lesohoz. Probl., Riga* No. 19, 1960 (195-200). [Russ.] N.L.L.

A brief review article based on information obtained during a study tour in late 1958, covering factories and research institutes in several provinces.

The hydrolysis industry uses mainly agricultural residues. In the review of the wood chemistry industry, brief notes are presented on: charcoal production; camphor production; the extraction of essential oils from leaves, bark, and wood (ca. 140 tree species are known to give valuable aromatic substances in satisfactory yield); the production of tannins; cellulose production from *Pinus massoniana* needles for use in the manufacture of artificial silk; pulping; chip- and fibreboard manufacture, etc.

861. Pulp and Paper Manufacture. Textile and other Cellulose Derivatives

See also Nos. 3526-7, 3541, 3550, 3599, 3608, 3674-5, 3692, 3715-6, 3808-9, 3819-21, 3959, 3961.

3822. TOMLINSON, G. H., II. Science of wood pulping. *Tappi* 44 (1), 1961 (133A-142A). 18 refs. P.R.

An introductory discussion of the underlying principles involved in pulping, with sections on the structure and chemical composition of wood, followed by a detailed description of the chief pulping processes, viz. groundwood, chemical and semichemical.

3823. BLINKA, J. Review of progress in mechanical pulping. *Tappi* 43 (12), 1960 (196A). 14 refs. P.R.

A very brief summary of recent N. American and European literature (1956-59) on the manufacture of groundwood pulp.

3824. LUHDE, F. Temperature within the grinding zone—Part I. Part II: Temperatures on a miniature grinder. *Pulp Paper Mag. Can.* 60 (9), 1959 (269-71); 61 (11), 1960 (546-52). 7 refs.

A detailed discussion of the thermal aspects of grinding, including findings on the temperatures reached in the stone, the wood, the grinding zone and the suspension formed.

3825. FOGH, I. F. An evaluation of the economics of supplying sawmill [waste] chips to pulp and paper mills. *Pulp Paper Mag. Can.* 62 (2), 1961 (95-101). 30 refs.

[Cf. *F.A.* 19 No. 2500.] An analysis of the economics of barking and chipping sawmill waste at the mill, and screening, loading, transporting and selling the chips to a pulp mill.

3826. DAHM, H. P., and LÖSCHBRANDT, F. Fliskvalitet og flishugging. [Chip quality and chipping.] *Norsk Skogind.* 14 (11), 1960 (419-26). 7 refs. [Nor.e.] P.R.

Comparative trials of hand sorting and screening showed considerable differences in the size distributions obtained [cf. *F.A.* 22 No. 1072]. In a study on the effect of knife sharpness on Spruce chip size, it was found that the range, but not the mean, of chip lengths increased as the knives grew blunt. In the material studied, the range of chip thickness was always greater than that of chip length, and a direct linear relationship existed between length and thickness. For screened chips, no relationship was found between the sharpness

of the knives and sulphite pulp yield or CI number. Fines give a pulp yield not much below normal, but the pulp was weak and easily cut during beating.

3827. WILSON, J. W., and WORSTER, H. The sulphite and sulphate pulping of subdivided chips. *Pulp Paper Mag. Can.* 61 (11), 1960 (524-8). 3 refs.

Subdivided (shredded) chips gave slight advantages over normal chips in both sulphite and sulphate pulping as regards cooking time and screened pulp yield when cooked to 40-45% yield, but pulp quality was slightly inferior.

3828. DOBROVOL'SKIY, D. S. Ob ispol'zovanii v bumažnoj promyshlennosti hvoynoj drevesiny, poražennoj sibirskim šelkoprijadom. [Utilization in the paper industry of softwoods attacked by *Dendrolimus sibiricus*.] *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (147-50). [Russ.]

Sulphate and sulphite pulps were made from samples of softwoods (Fir, Spruce, Siberian Pine) in different stages of decay following *D. sibiricus* attack. Cooking methods and results are briefly discussed. It is concluded that these dead and decaying softwoods (even those with a significant amount of rot) are suitable for making various cardboards and certain low-grade papers. The hemicellulose yield from dead, standing timber, undamaged by rot, is not significantly different from that from freshly felled, healthy stands, but the hemicellulose yield decreases with increasing amount of rot.

3829. Pulp and paper from [tropical] hardwoods. *Technical Note, Forest Products Research Institute, Laguna, Philippines* No. 6, 1960. pp. 4. 3 refs. P.R.

Lists the pulping processes available in the Philippines for the country's wide variety of commercial hardwoods. Brief descriptions are given of the following methods: (1) groundwood; (2) chemical, viz. (a) sulphite, (b) soda, and (c) sulphate; and (3) semichemical, viz. (a) chemigroundwood, (b) cold NaOH and (c) neutral sulphite semichemical.

3830. MOTTET, A. L'utilisation des bois feuillus en papeterie et dans l'industrie des panneaux de fibres. [The use of hardwoods in papermaking and the fibreboard industry.] *Ann. Gembl.* 66 (4), 1960 (273-91). 29 refs. [F.] A.P.B.

A brief review of methods and equipment, based largely on literature from the U.S.A.

3831. HYTTINEN, A., MARTIN, J. S., and KELLER, E. L. Pulping and papermaking experiments on Quaking Aspen from Colorado. *Rep. U.S. For. Prod. Lab., Madison* No. 2180, 1960. pp. 5 + 8 tbls. P.R.

Describes and discusses groundwood, sulphite, sulphate, and semi-mechanical pulping experiments made at Madison. Magazine coating-base papers made from the pulps showed that the sulphite pulp was stronger than that made from Lake States Aspen, while the other pulps were almost as strong as the corresponding pulps made from Lake States Aspen.

3832. KALISTRATOV, G. A. Pulp from Aspen. *Bumažnaja Promyshlennost', Moskva* 35 (5), 1960 (12-4). [Russ.] From *abstr.* in *Chem. Abstr.* 54 (22), 1960 (25807). P.R.

Laboratory and plant experiments showed that high-yield pulp with good strength properties was obtainable by cooking Aspen with a sulphite liquor containing 0.98-1.02% CaO and 4.0% total SO₂. The initial temperature was 40° C. and the final 135-7°, the cooking time 4-10 hours, and the wood/liquor ratio 1/5. Yields of 52.7-73.2% were obtained. Mechanical properties resembled those of Spruce. Spent liquor contained very little sugar, and so was not considered an economic source of alcohol (by fermentation).

3833. PEARL, I. A., and BEYER, D. L. Studies on the chemistry of Aspenwood. VII. Further studies on the ether extractives of commercial Aspen spent liquor. *J. organ. Chem.* 26 (2), 1961 (546-50). 15 refs. O.R.S.

Extractives of a liquor from the pulping of peeled mixed Aspen (*Populus tremuloides*, *P. grandidentata* and *P. tacamahaca*) were investigated. [Cf. *F.A.* 22 No. 1180.]

3834. PEARL, I. A., and MCCOY, P. F. Studies on the chemistry of Aspenwood. VIII. An investigation of the neutral extractives of commercial spent Aspen liquor [from *Populus tremuloides*, *P. grandidentata* and *P. tacamahaca* pulped together]. *J. organ. Chem.* 26 (2), 1961 (550-2). 8 refs. O.R.S.

3835. BACK, E. Tracheidal and parenchymatous cells in *Picea abies* (Karst.) pulpwood and their behaviour in sulphite pulping. The resin in parenchymatous cells in resin canals of conifers. *X. Svensk PappTidn.* 63 (20), 1960 (695-8). 20 refs. [E.e.sw.g.] P.R.

The weight fraction of ray cells plus non-ray parenchyma cells in a high-yield Spruce sulphite and a Spruce sulphate pulp was determined to be ca. 6%. From this, the weight fraction of these cells in the wood was estimated at 4%. Data from earlier studies [see *F.A.* 22 Nos. 2340-1] are used in estimating that tracheidal ray cells make up 18% of the ray volume and 16% of the ray cell weight in Spruce wood. Analyses of pulps and rejected fines from sulphite pulps are given, as an indication of the behaviour of ray cells during pulping.

3836. BACK, E. Resin in conifer pulpwood and fundamentals of pitch control in pulp and paper manufacture. *Svensk PappTidn.* 63 (22), 1960 (793-802). 93 refs. [E.] P.R.

Reviews and discusses earlier papers by the author and others [cf. *F.A.* 21 No. 2289; 22 No. 2401].

3837. ELLEFSEN, Ø., and LANGSETMO, O. Varying timber transport and storing conditions and the [ir] influence upon the pitch deposits of the corresponding unbleached pulps. *Norsk Skogind.* 14 (11), 1960 (474-8). 5 refs. [E.e.nor.] P.R.

Spruce used in the study was felled in Oct., Dec. or March and stored for 1-7 months in the forest before transport by lorry or floating by routes

taking 2 and 5 months respectively. Subsequent storage was for 2, 4 or 6 months in water or on land, for 18 months on land, or for 3 months on land after the different periods of water storage. Pitch deposits of the various unbleached sulphite pulps obtained increased with log storage time for all combinations of transport and storage, the increase being more pronounced for water storage. Significantly larger pitch deposits were obtained from pulp from floated logs. Logs felled in Oct. yielded somewhat lower pitch deposits than those felled in Dec. or March.

3838. MARTIN, J. S., SIMMONDS, F. S., and FAHEY, D. J. **Pulping and papermaking experiments on Redwood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2181, 1960. pp. 6 + 4 tpls. P.R.

Discusses the results of experiments in which the properties of *Sequoia sempervirens* sulphate pulp were examined. The pulp had excellent strength, that from second-growth wood being stronger than that from old-growth wood in all properties save tearing resistance. Mixture with experimentally made Douglas Fir pulp improved tearing resistance, possibly through the lower lignin content and higher density of the latter.

3839. COHEN, W. E. **Papermaking properties of dense Eucalypt woods. I. Effects of physical treatments and chemical additives on *Eucalyptus hemiphloia* sulphate pulp [with discussion].** *APPITA, Melbourne* 14 (3), 1960 (108-26). 4 refs.

3840. KHRISTOV, Ts. [HRISTOV, C.], and KAJRAKOVA [KAJRAKOVA], I. **Influence of the sulfide content in lye on the preparation of cellulose from wood fibres of *Ailanthus glandulosa* (*A. altissima*) by the sulphate method.** *Himija i Industrija, Sofija* 32 (4), 1960 (102-7). [Bulg.] From *abstr. in Chem. Abstr.* 55 (4), 1961 (3975). P.R.

In tests made on the fibres of 12-year *A. altissima*, a sulphide content of 25-30% [cooking data given] yielded cellulose with the best physical and chemical properties.

3841. LAUER, K., and CHAO-WU, H. **Viscose grade pulps from sawdust of Loblolly Pine [*Pinus taeda*] and Gum.** *Tappi* 43 (11), 1960 (165A-168A). 2 refs. P.R.

Describes the successful production of suitable viscose-grade pulps from sawdust of Gum [*Liquidambar styraciflua*] and Loblolly Pine by prehydrolysis-sulphate treatment despite previously reported difficulties of utilizing such sawdust, arising from the irregular removal of lignin [see *F.A.* 21 No. 5108]. Pulp quality was considerably improved by defibration and screening the sawdust after acid prehydrolysis, the reason being the greater uniformity obtained in the degree of polymerization of the pulp.

3842. KALNINŠ, A. I., and MURAŠČENKO, N. F. **Antiseptirujuščie svojstva proizvodnyh lignosul'fonovykh kislót. [The preservative properties of lignosulphonic acids.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 19, 1960 (201-6). 10 refs. [Russ.russ.] N.L.L.

Investigates the effect of preservatives (1) based on salts of lignosulphonic acids, and (2) obtained by strengthening the tanning properties of the lignosulphonic complex.

3843. WRIST, P. E. **The science of paper manufacture.** *Tappi* 44 (1), 1961 (181A-199A). 70 refs. P.R.

A survey of the main aspects of the papermaking process, with special emphasis on the importance of studies on the morphology and chemical composition of wood (illustrated by drawings and photomicrographs of various Spruce and Pine tracheid cell walls, microfibrillar structure, etc.).

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 3715, 3821, 3830, 3874.

3844. KUMAR, V. B. **Die statistische Qualitätskontrolle in der Spanplattenindustrie—Dritte Mitteilung: Eigenschaften der Spanplatten. [Statistical quality control in the particle board industry. III: Properties of the particle boards.]** *Holz Roh- u. Werkstoff* 18 (11), 1960 (422-7). 14 refs. [G.g.e.] P.R.

[See *F.A.* 22 No. 2554.] Discusses statistical quality control of thickness, density, water absorption, swelling, bending strength, and tensile strength for various types of 3-layer boards made by the Behr method. Water absorption and thickness swelling are the properties least controllable and susceptible to the greatest variation. Of the mechanical properties, bending strength shows the greatest variation.

3845. **Holzspanplatten. Begriffe und Eigenschaften. [Particle boards. Concepts and properties.]** *Dtsch. Norm. No. DIN 68761*, 1960. pp. 3. [G.] P.R.

A draft German standard covering types, dimensions, physical and strength properties, etc.

3846. NEUSSER, H. **Spanplattenprüfung in Versuchsanstalt und Betriebslaboratorium. [Testing chipboards in research laboratory and in workshop.]** *Materialprüfung, Düsseldorf* 2 (8), 1960 (295-300). 16 refs. [G.g.e.f.e.f.] N.C.L.

Describes the methods used at the wood research laboratory, Vienna, for the testing of chipboards, including variations in density and thickness, chip direction, strength properties, dimensional stability, warping, surface quality, adhesive content, etc.

3847. JUKNA, A. D., and OZOLINŠ, A. P. **Metod skorostnogo opredelenija fiziko-mehaničeskikh i tehnoloģičeskikh svojstv stružčnyh plit. [Method of rapidly determining the physical, mechanical and technological properties of particle boards.]** *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (27-33). 3 refs. [Russ.russ.] N.L.L.

Tabulates data obtained with the AP-Z instrument [see *F.A.* 22 No. 2379] on the density, moisture content, static bending, compression and tensile strength of boards made from sawdust and from chips. Results showed the instrument to be suitable for rapid tests of particle-board properties under factory and laboratory conditions.

3848. OZOLINŠ, A. P. Nekotorye svoystva stružecnyh plit i metody ih opredelenija. [Certain properties of particle boards, and ways of determining them.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (71-87). 15 refs. [Russ.russ.] N.L.L.

Describes the methods used at Riga to test the density, moisture content, absorption of water and atmospheric moisture, water permeability, static bending, compression, tensile strength, shear, hardness, nail- and screw-withdrawal resistance, and the strength of various kinds of glued joint, for Latvian-made particle boards. Data on the results are tabulated. The most important properties to test are static bending and tensile strength $\perp$, density, water absorption, and screw-withdrawal resistance. The best test of joint strength was compression; impact testing gave results less accurate, and difficult to compare. The strongest joints were those with round or flat pins or dowels.

3849. LIIRI, O. Tutkimuksia lastulevyjen ominaisuuksista. [Investigations on properties of wood particle boards.] *Pap. ja Puu* 43 (1), 1961 (3-17). 2 refs. [Fic.e.] P.R.

Tests were made on 3 boards each of 4 Finnish and 5 European types of particle board. Tabulated results show density, variations in thickness, strength properties, screw holding, and swelling after soaking or humidification. Only slight differences were found between the Finnish and other boards.

3850. SUCHSLAND, O. An analysis of a two-species three-layer wood flake board. *Quart. Bull. Mich. Agric. Exp. Sta.* 43 (2), 1960 (375-93).

A three-layer flake board is a sandwich construction manufactured in a one-step process. The manufacture of the individual layers and their lamination are subject to the same press cycle. This limits the density ratio of core and face and makes a direct control of the board properties impossible. The relationship between core density, face density, shelling ratio and equivalent modulus of elasticity in bending can be expressed mathematically for a given raw-material combination. This relationship is graphically demonstrated for a two-piece, three-layer flake board consisting of Aspen faces and Elm core at an over-all density of 0.700 g./c.c. By including the test results in this graph, the effects of certain raw material and process variables on properties of the board are demonstrated. *From author's summary.*

3851. KOPERIN, F. I., and ADO, Ju. V. Ispol'zovanie gniloj drevesiny dlja izgotovlenija drevesno-voloknistyh i drevesno-stružecnyh plit. [Using rotten wood for making fibreboards and chipboards.] *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (143-5). [Russ.]

Pine and Spruce wood, attacked by *Trametes* [*Fomes*] *pini* and *T. abietis* respectively, was chipped and mixed in various proportions with a powder made of wood in the last stages of brown rot, and hot-pressed without binders (180 kg./sq. cm., 10 min., 210° C.). The physical and mechanical properties of the boards (tabulated) were found to be satisfactory, though optimum press schedules have still to be determined.

3852. BURROWS, C. H. Particle board from Douglas-Fir bark without additives. *Inform. Circ. Ore. For. Prod. Res. Cent.* No. 15, 1960. pp. 40. 15 refs.

Slabs of Douglas-Fir bark were collected from a veneer mill and reduced to particles at the Oregon Forest Research Center; the particles were then dried and screened to specification. A total of 324 boards one foot square were prepared and tested. Data from tests were analysed statistically. Main effects and interactions of 4 factors—particle size, moisture content of the mat, pressing pressure, and type of overlay—were examined. Each of these factors had 3 levels, or conditions. Oven-dry weight of bark for each board, and both pressing temperature and time were held constant. Boards were cooled before being removed from the press. Results of analysis showed that pressing pressure and type of overlay were very significant determinants of physical properties. Increase of pressing pressure caused general improvement of properties; use of overlays usually improved properties. Moisture content of the mat had a moderate effect on physical properties, size of particles apparently little. [Cf. *F.A.* 22 No. 1190.]

3853. JUKNA, A. D., and OZOLINŠ, A. P. Umenšenie vodopogloščаемости stružecnyh plit putem vvedenija petrolatuma. [Reducing water absorption by particle boards by introducing petrolatum into them.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (67-70). 4 refs. [Russ.russ.] N.L.L.

In further water-repellency tests [cf. *F.A.* 21 No. 5127], petrolatum was added (10, 20 and 30% of the oven-dry weight of chips) to boards made with various types of binder. Results of water absorption swelling, and strength tests are tabulated. The addition of 10% petrolatum reduced board strength (static bending, and compression) by 10-25%, the greater additions even more, and all three significantly reduced water absorption and swelling. There was little difference between the water-repellent properties of petrolatum and paraffin wax, and further tests should aim at comparing the application of the petrolatum to the particles as an emulsion and as a hot spray.

3854. BALINT, J. E. A method for proportioning resin and wax in particle-board. *For. Prod. J.* 10 (11), 1960 (567-70).

Describes an automatic precision control for adding resin and wax in correct proportion to the weight of the chips, their moisture content, etc.

3855. ZIEDINŠ, I. O. Issledovanija izmenenij vlažnosti v drevesno-stružecnoj plite vo vremja gorjačego pressovanija. [Investigations on changes in particle-board moisture content during hot pressing.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (47-65). 5 refs. [Russ.russ.] N.L.L.

Reports laboratory studies on the changes in m.c. during the hot-pressing (without binders) of five-layer particle boards. The changes in m.c. in the one central, two intermediate, and two outer layers with pressing time, press temperature, and method of moistening the outer layers, are graphed. It is

concluded that the best technique is to use a press temperature of 170–180° C., and to spray only the outer layers with water (100–200 g./sq. m., depending on the thickness and density of the board).

3856. MININ, A. N. Vlijanie temperatury izmel'chennoj drevesiny v moment pressovaniya na svoystva drevesnykh plastikov. [Influence of the temperature of wood particles during pressing on the properties of the boards.] *Lesn. Zh., Arhangel'sk* 2 (5), 1959 (128–35). 4 refs. [Russ.russ.]

[Cf. F.A. 21 No. 3771.] With increasing press temperature, the strength and density of the product increase, the greatest increase being noted at 180–225° C. With pressing times of 2½ min. per mm. of finished board thickness, and pressures of 250 kg./sq. cm., the optimum press temperature is 185–200°. The boards should be cooled to 25–30° before removal of pressure, and the piezothermal treatment should be done in a hermetically closed press. From author's summary.

3857. TRAJTEL'MAN, G. JA., VINOGRADOV, JU. N., and DENISOV, O. V. Èksperimental'naja laboratornaja ustanovka dlja gorjacego pressovaniya drevesno-stružičnykh plit pri povyšennykh temperaturah. [Experimental laboratory rig for hot-pressing particle boards at elevated temperatures.] *Lesn. Zh., Arhangel'sk* 2 (5), 1959 (168–9). [Russ.]

Presents a drawing of the heat-control system of the rig, which is designed for temperatures of 180–250° C., and gives some data on the boards made.

3858. ZIEDIN'Š, I. O. Fanerovanie drevesno-stružičnykh plit i ispytanie predela pročnosti pri skalyvanii po kleeovomu sloju. [Veneering particle boards, and testing the glue-line shear strength.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (35–45). 2 refs. [Russ.russ.] N.L.L.

Boards were made of (1) sawdust (passed through a 3-mm. sieve), (2) planer shavings (4–10 × 2–8 × 0.3–0.8 mm.), and (3) comminuted packing shavings (20–30 × 1–3 × 0.6–1.3 mm.), and 3 types of binder, and were faced on both sides with a Birch veneer, using a urea-formaldehyde and a casein glue. Glue-line shear tests showed that simultaneous veneering and pressing of the boards reduced the board/veneer glue-line strength, i.e. it was better to veneer after the boards had been made. Glue-line strength was least with (1); it was 8% greater with (3), and a further 7% greater with (2).

3859. AKAI, S., and UYAMA, A. [Studies on the microbial stain and decay of building boards and their prevention. I. Compulsive decay test of building boards by some wood-destroying fungi.] *J. Jap. Wood Res. Soc.* 6 (3), 1960 (128–32). 3 refs. [Jap.jap.e.e.] P.R.

Presents tabulated and graphed results of tests in which particle-board samples were examined 100 days after inoculation with *Gloeophyllum subferrugineum*, *Poria vaporaria*, *Schizophyllum commune*, *Trametes dickinsii* and *T. sanguinea* [cf. F.A. 20 No. 5267]. The most severe damage was caused by *P. vaporaria*, but good control of all the fungi was obtained by using phenolic resin as a sizing agent, melamine resin proving far less effective.

Recommendations are made for the use of suitable anti-fungal additives in the preparation of the board.

3860. BECKER, G. Protection of fibre and chip-boards against wood-destroying organisms in the tropics. *Comp. Wood.* 6 (4), 1959 (33–6). 29 refs. P.R.

From an examination of the literature, the author discusses current measures of chemical preservation of fibreboards and particle boards, and reviews the opportunities for industries interested in exporting preservatives for the control of Basidiomycetes, Ascomycetes and Fungi Imperfecti in tropical areas.

3861. NIKOLAEV, A. P. Primenenie drevesno-stružičnykh plit dlja otelki pomeščenij i izgotovlenija mebeli. [The use of particle boards for finishing off rooms and making furniture.] *Trud. Inst. Lesohoz. Probl., Riga* No. 18, 1960 (177–82). [Russ.] N.L.L.

A general account of various uses of particle boards in the building and furniture industries in the U.S.S.R., e.g. for facing walls, making parquet flooring, ceilings, furniture, etc., and also of some techniques in using the boards, e.g. jointing, edging, colouring etc.

3862. NAFFZIGER, T. R., CLARK, T. F., and WOLFF, I. A. Structural board from domestic timber: Bamboo—*Phyllostachys bambusoides*. *Tappi* 44 (2), 1961 (108–12). 12 refs. P.R.

The results of experimental manufacture of hard-boards and insulating boards from *P. bambusoides* chips pulped with 6–12% lime at 142° C. for 1–3.5-hour periods, indicated strength properties comparable to those of commercial boards made from pulpwood or bagasse.

3863. SOLEČNIK, N. JA., and NOVOSEL'SKAJA, A. I. Ispol'zovanie odubiny dlja proizvodstva drevesno-voloknistykh plit. [The utilization of tan waste for fibreboard production.] *Lesn. Zh., Arhangel'sk* 3 (2), 1960 (134–7). 3 refs. [Russ.russ.]

[Cf. F.A. 19 No. 4996; 20 No. 1234.] It was found that the tan waste (Oak chips after the tannins had been extracted) could be made into boards satisfying the requirements of Soviet Standard GOST 4598–53. The best method of defibration was by cooking with Ca(OH)₂ (CaO at 6–6.5% of oven-dry weight of chips) for 1½ hr. at 165° C. to a final pH of 7.5–8. Some of the physical and mechanical properties of hard, semi-hard, and porous boards made with this material are tabulated.

863. Wood Hydrolysis. Saccharification

See also Nos. 3820–1.

3864. KAL'NINA, V. K., and TAUBIN, B. M. Razmol drevesiny na vibromel'nice M-200. [Grinding wood [for hydrolysis] in the M-200 vibro-mill.] *Trud. Inst. Lesohoz. Probl., Riga* No. 19, 1960 (151–7). 13 refs. [Russ.russ.] N.L.L.

An analysis of the work of this standard Soviet mill [which is not described] in grinding various lots of sawdust, etc.

866. Utilization of Wood Extractives

See also Nos. 2740, 3821, 3863.

3865. Voprosy piroliza drevesiny i ekstraktivnyh vešestv hvoyjnyh porod. [Problems of wood pyrolysis and the extractives of coniferous species.] *Trud. Inst. Lesohoz. Probl., Riga* No. 16, 1958. pp. 233. Many refs. [Russ.] N.L.L.

Twenty-one papers presented at a conference at Riga, 30 Jan.-2 Feb. 1957, including the following: Charcoal—properties and scope of use (V. N. Kozlov); The effect of heat treatment on the nature of the fibre of Spruce holocellulose (V. N. Sergeeva and S. V. Miljutina) [with temperatures from 105 to 285° C.]; The composition of pre-pyrolysis resins (N. F. Komšilov, A. I. Kataev, M. N. Letonmjaki et al.); Intensification of resin extraction (G. D. Atamančukov); Extraction of resinous substances from the fibrous mass of fresh and mature Pine stumpwood in a continuous-action, screw-type, two-column apparatus—D-200 (F. A. Mednikov and E. V. Ušakova); Extraction of resinous substances from Pine stumpwood with organic solvents (I. P. Kolenko and V. N. Kozlov) [cf. F.A. 21 No. 1191]; The ILP pneumatic drier designed by the Institute of Forestry Problems, Riga, for drying certain wood and plant products (Ja. T. Abolin's) [cf. F.A. 22 No. 2513]; The utilization of "living elements" of wood (F. T. Solodkij) [a review of the possibilities of extraction of medicinal and food substances]; The possibilities of using extractives from conifer needles (V. Ė. Ėbele); The distribution of gum [arabogalactan] in *Larix gmelinii* wood (I. P. Cvetaeva) [cf. F.A. 21 Nos. 2336, 4924]; The practical utilization of the gum and extracted chips of *L. gmelinii* (A. F. Zajceva) [the chips, after extraction, were used for making sulphate kraft pulps, bleached and unbleached viscose pulps, and hard fibreboards—cf. F.A. 21 No. 2336].

3866. SADGOPAL. Exploratory studies in the development of essential oils and their constituents in aromatic plants. Part I. Oil of agarwood. *Soap, Perfumery and Cosmetics, London* 33 (1), 1960 (41-6). P.O.

Describes the tree, *Aquilaria agallocha*, from which the highly aromatic agarwood is obtained, giving analyses of the oils and discussing the association of the aromatic part of the wood with fungus and insect attack.

867. Destructive Distillation

See also Nos. 3683, 3820-1, 3865.

3867. JARVIS, J. P., JR. The wood charcoal industry in the state of Missouri. *University of Missouri Bulletin, Columbia, Mo.* 61 (21), 1960. pp. 31. 62 refs. P.R.

Outlines the history, present developments and future possibilities of the industry, in the light of the steadily increasing U.S. demand for the product, continued improvements in charcoal kilns, and the ready availability of very suitable raw material, viz. scrub Oak and Hickory, in Missouri.

3868. PRITCHARD, W. M. A simplified charcoal retort for batch operation. *For. Prod. J.* 10 (12), 1960 (640-1).

The retorts consist of airtight cylinders, 10 ft. in diam. and 16 ft. high, fed from above and emptied from the bottom, through which pass five special 8-in. flues open at both ends. The wood gases are vented into these flues and, after an initial heating-up period (30 min. to 2 hr.) supplied from outside, provide all the heat necessary; no fans or moving parts are needed. Excess gas can be used for drying wood or heating up another retort. With kiln-dry Oak waste, preheating, carbonization, and cooling took ca. 16 hr. and with green slabs not much longer, making possible the production of 5000 lb. charcoal per 24-hr. cycle, with a yield of ca. 700 lb./ton of raw material. With operating costs ca. \$18/ton and cheap wood waste, the process would be economic at an output of 740 tons/week, preferably in combination with a briquetting plant.

3869. SIMMONS, F. C. Three new charcoal retorts. *FAO For. Equipm. Note* No. E.24.60, 1960. pp. 3.

Describes 3 new types of vertical charcoal retort developed in the N.E. United States in recent years: the Keil-Pfaudler, Warner-Vega, and Fenimore Thomas.

3870. CERNAEV, P. Văzmožnosti za izpolzuvane na dărvsnite otpadăci v bukovite ni gori črez suha destilacija v podvižni retorti. [Possibilities of utilizing waste wood from Bulgarian Beech forests by dry distillation in mobile retorts.] *Nauč. Trud. Lesoteh. Inst., Sofija* No. 8, 1960 (247-54). 5 refs. [Bulg.g.]

Describes the design of the mobile retort, and its performance.

3871. LJAMIN, V. A., and BOL'ŠAKOVA, N. A. Opyt pererabotki drevesiny metodom gasifikacii. [Gasification of wood.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (157-65). 4 refs. [Russ.]

Describes the apparatus designed by the LTA (Leningrad Forestry Academy) for the gasification of wood chips, and pilot trials with it.

3872. LJAMIN, V. A., and AVAKJAN, N. D. Vyhody produktov pri gazifikacii ščepy iz ol'hovoyh drov. [Yields of products from the gasification of chipped Alder waste wood.] *Lesn. Ž., Arhangel'sk* 3 (2), 1960 (145-7). 3 refs. [Russ.]

Presents tabulated data of yields from chips air-dried under cover.

3873. MCGINNESS, J. D., WHITTENBAUGH, J. A., and LUCCHESI, C. A. Composition of guaiacol fraction of tar acids. *Tappi* 43 (12), 1960 (1027-9). 8 refs. P.R.

On analysis by gas-chromatography and infra-red spectroscopy, the fraction obtained from Birch, Beech or Maple was found to contain: guaiacol; phenol; *o*-, *p*- and *m*-cresol; 3, 5 and 2, 4-xenol; 2-methoxy-4-methylphenol; and 2-methoxy-4-ethylphenol.

89. Other ('Minor') Forest Products**892. Vegetable Products**

See also No. 2925.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 2740, 3122, 3541, 3564, 3630, 3668, 3821, 3852, 3889, 3920.

3874. SARVIS, J. C. **Bark utilization study.** *Res. Note West. Pine Ass.* No. 7.221, 1954 (rev. 1959). pp. 11.

Gives the quantity of bark obtained per 1000 bd. ft. for 10 softwood species, and discusses its utilization in 4 main categories: (1) fuel, including machinery for preparation; (2) agricultural—mulches, poultry and livestock bedding; (3) uses dependent on physical and mechanical properties—insulation, flooring, particle boards, felts, etc; (4) chemicals derived by extraction or modification.

3875. ENDRES, H., and LEPPMAYER, F.; ENDRES, H., and MERKLE, K.; ENDRES, H., MERKLE, K., and BAURIEDL, H. Über die Gerbstoffe der Fichtenrinde. XII. Isolierung und Konstitutionsermittlung eines *Picea*-tannol-monoglucosides; XIII. Isolierung weiterer Verbindungen aus dem Fichtenbast; XIV. Isolierung eines Trihydroxy-tetralin-glucosides aus Fichtenbast. [The tannins of Spruce bark. XII. Isolation and constitution of a tannol-monoglucoside. XIII. Isolation of further compounds from Spruce bast. XIV. Isolation of a trihydroxy-tetralin-glucoside from Spruce bast.] *Chem. Ber.* 94 (2), 1961 (419–41). 41 refs. [G.g.] P.R.

3876. MAYER, W., et al. Castalagin und Vesalagin, zwei neue, kristallisierte Ellagengerbstoffe aus dem Holz der Edelkastanie und Eiche. [Castalagin and vescalagin, two new crystallized ellagitanins from wood of *Castanea sativa* and *Quercus sessiliflora*.] *Naturwissenschaften* 46 (24), 1959 (669–70). 5 refs. [G.] O.R.S.

3877. GORDON-GRAY, C. G., and JONES, R. A. The significance of sub-standard bark in the production of Wattle extract. *Rep. Wattle Res. Inst. S. Afr.* 1959/60, 1960 (39–43). 2 refs.

Experiments with a number of samples showed that the existing standard, by which only grey bark is regarded as acceptable, and green bark is excluded, involving the rejection of the uppermost 7–14 ft. of a tree, is unnecessarily strict; tests showed that there was no significant change in tannin content corresponding with the change in colour. On the other hand, bark from trees suffering from black-butt disease was found not to be acceptable.

3878. FAROOQ, M. O., VARSHNEY, I. P., and NAIM, Z. Saponines et sapogénines. V. Les saponines et les sapogénines de l'*Acacia intsia* Willd. [Saponins and sapogenins. V. Saponins and sapogenins of *A. intsia*.] *Annales Pharmaceutiques Françaises*, Paris 17 (6), 1959 (442–6). 7 refs. [F.e.] L.S.

The bark of this species, widely used for washing and cleaning in India, contained a substance responding to all tests for saponin. On hydrolysis, this yielded an acid and two neutral sapogenins, one of which was identified as lupeol. [Cf. F.A. 20 No. 1266.]

3879. SONDHEIMER, F., and MEISELS, A. Constituents of *Casimiroa edulis* Llave et Lex.-VI.

2',5,6-trimethoxyflavone, 2',5,6,7-tetramethoxyflavone (zapotin) and 5-hydroxy-2',6,7-trimethoxyflavone (zapotinin). *Tetrahedron, Lond.* 9 (3/4), 1960 (139–44). 19 refs. [E.e.] O.R.S.

From the root bark. [Cf. F.A. 22 No. 2748.]

3880. NAIR, G. V., and RUDLOFF, G. VON. Isolation of hyperin from [bark of] Red-osier Dogwood (*Cornus stolonifera* Michx.). *Canad. J. Chem.* 38 (12), 1960 (2531–3). O.R.S.

3881. SENGUPTA, P., CHOUDHURI, S. N., and KHASTGIR, H. N. Terpenoids and related compounds—I. Constituents of the trunk bark of *Melia azadirachta* Linn. and the structure of the ketophenol, nimbol. *Tetrahedron, Lond.* 10 (1/2), 1960 (45–54). 24 refs. [E.] O.R.S.

3882. BRIGGS, L. H., et al. Constituents of *Eugenia maire* A. Cunn. Part I. A trimethyl ether of ellagic acid and mainrin, a new triterpene. *J. Chem. Soc. Feb.*, 1961 (642–5). 13 refs. O.R.S.

A new, naturally occurring trimethyl ether of ellagic acid, β -sitosterol and mainrin were isolated from trunk bark. The ether has been identified as 3,3',4-tri-*O*-methylellagic acid. *From authors' summary.*

3883. RANGASWAMI, S., and VENKATA RAO, E. Chemical components of *Plumieria alba* Linn. *Proc. Indian Acad. Sci.* 52A (4), 1960 (173–81). 9 refs. O.R.S.

Extraction of the powdered bark with solvents and fractionation yielded amyrrin acetate, amyrrin, β -sitosterol, scopoletin and plumieride, with four minor components in yields too small to allow closer examination.

3884. LAWRIE, W., MCLEAN, J., and TAYLOR, G. R. Triterpenoids in the bark of Mountain Ash (*Sorbus aucuparia* L.). *J. Chem. Soc. Nov.*, 1960 (4303–8). 9 refs. O.R.S.

A petroleum extract of the bark yielded lupeol and betulin. From an ether extract of the defatted bark, 23-hydroxybetulin was isolated. *From authors' summary.*

3885. ARTHUR, H. R., and LEE, C. M. An examination of the Rutaceae of Hong Kong. Part V. A new coumarin from the bark of *Zanthoxylum avicennae*. *J. Chem. Soc. Nov.*, 1960 (4654–7). 7 refs. O.R.S.

[Cf. F.A. 21 No. 3873.] Degradation revealed that the coumarin, avicennin ($C_{20}H_{22}O_4$), is a substituted 2,2-dimethylchromenocoumarin. *From authors' summary.*

3886. SOGO, M. [Nitrobenzene oxidation products from bark lignin of broadleaved trees and coniferous trees.] *Tech. Bull. Fac. Agric. Kagawa Univ.* 10 (1), 1960 (46–50). 11 refs. [Jap.jap.e.] A.P.B.

The inner and outer bark lignins of *Pinus densiflora*, *Chamaecyparis obtusa*, *Cryptomeria japonica* and *Ginkgo biloba* proved to contain building stones [aromatic nuclei] of the free and condensed guaiacyl, 3,4-dihydroxyphenyl, and *p*-hydroxyphenyl types, but few or none of the syringyl type,

whereas those of *Salix bakko*, *Prunus donarum* var. *spontanea*, *Cinnamomum camphora* and *Melia azedarach* var. *japonica* contained aromatic nuclei of all the above types. Sapwood lignin lacked the 3,4-dihydroxyphenyl type. *From author's summary.*

892.5. Christmas Trees. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also No. 3865.

3887. ABOLINŠ, JA. T., BAŠKO, JU. JA., and GAVRILOV, V. A. Ceh proizvodstva hvojnoj i drevesnoj muki. [A factory for the production of [vitamin] flour from conifer needles and twigs.] *Trud. Inst. Lesohoz. Probl.*, Riga No. 18, 1960 (157-71). 4 refs. [Russ.] N.L.L.

[Cf. F.A. 21 No. 5150.] A full account, giving details of the composition of the flour, the design of the factory (with the building materials required), the rapid drier used, the factory plant, labour requirements, etc.

3888. MORTON, J. F. The Emblic (*Phyllanthus emblica* L.). *Econ. Bot.* 14 (2), 1960 (119-28). 53 refs.

Covers distribution, habit, composition of fruit, food and medicinal uses. This wild tree of S.E. Asia bears fruit of high vitamin C content, lending itself to mass harvesting, bulk packing and long-distance transport. The manufacture of a beverage is recommended.

3889. TARPO, E., and CUCU, V. The value of indigenous *Frangula* bark. *Farmacia, Bucharest* 8, 1960 (371-5). [Rum.?] From *abstr.* in *Chem. Abstr.* 55 (3), 1961 (3003). P.R.

The most frequently observed value of the total hydroxymethylanthraquinones of *Rhamnus frangula* bark, estimated photometrically, was ca. 2% (extreme values 1.50 and 3.52%). Of these total values, the content of free hydroxymethylanthraquinones varied between 0 and 3.98%.

3890. CAHEN, R., HIRSCH, C., and PESSONNIER, A. Étude pharmacodynamique de l'aubier de *Tilia sylvestris* Desf. Mécanisme de l'effet spasmolytique intestinal. [Pharmacodynamic study of sapwood of *T. cordata*: mechanism of the intestinal spasmolytic effect.] *C. R. Acad. Sci., Paris* 251 (14), 1960 (1433-5). 7 refs. [F.f.] O.R.S.

3891. BISSET, N. G. The occurrence of alkaloids in the Apocynaceae. *Annales Bogorienses, Bogor* 3 (1), 1958 (105-236). 610 refs. [E.e.] L.S.

Presents a detailed review, with data drawn from literature. There is evidence that alkaloidal material is probably present in ca. 60 genera, but only ca. 30 include species in which it is a major secondary plant product.

3892. RAPOPORT, H., et al. Alkaloids of *Geissospermum velosii*. Further studies on geissospermine and the structure of the indolic cleavage products, geissoschizine and apogeissoschizine. *J. Amer. Chem. Soc.* 82 (16), 1960 (4404-14). 20 refs. O.R.S. [Cf. F.A. 20 Nos. 1251-2.]

3893. JANOT, M.-M., CAVÉ, A., and GOUTAREL, R. Togholumine, holaphyllamine et holaphylline: trois nouveaux alcaloïdes retirés des feuilles d'*Holarrhena floribunda* (G. Don) Dur. et Schinz. [Togholumine, holaphyllamine and holaphylline: three new alkaloids from the leaves of *H. floribunda*.] *Bull. Soc. Chim. France* 1959 (6), (898-900). 14 refs. [F.f.] O.R.S.

3894. BICK, I. R. C., CLEZY, P. S., and VER-NEGO, M. J. Alkaloids of *Daphnandra* species. Part VI. The structures of daphnandrine, daphnoline and aromoline. *J. Chem. Soc. Dec.*, 1960 (4928-31). 12 refs. O.R.S. [Cf. F.A. 14 Nos. 3984-5.]

3895. RAPOPORT, H., and HOLDEN, K. G. Alkaloids of *Balfourodendron riedelianum*. Balfouroidine and isobalfouroidine. *J. Amer. Chem. Soc.* 82 (16), 1960 (4395-4404). 22 refs. O.R.S. [Cf. F.A. 21 No. 1217.]

3896. PACTHER, I. J., et al. The alkaloids of *Hortia arborea*. *J. Amer. Chem. Soc.* 82 (19), 1960 (5187-93). 15 refs. O.R.S.

Seven bases were isolated from the bark. Of these, 4 (dictamine, γ -fagarine, nor- γ -fagarine and skimmianine) are of the furoquinoline type, and 3 (rutecarpine and the two new alkaloids hortiamine and hortiacine) are of the quinazoline group. Hortiamine and hortiacine are characterized.

3897. DAVIDEK, J. Isolation of chromatographically pure rutin from flowers of Elder [*Sambucus nigra*]. *Nature, Lond.* 189 (4763), 1961 (487-8). 9 refs.

3898. POLONSKY, J. Sur les constituants de l'écorce de *Simaruba amara*: isolement d'un nouveau principe amer: le simoralide. [Constituents of the bark of *S. amara*: isolation of a new bitter principle—simoralide.] *Bull. Soc. Chim. France* 1959 (10), (1546-7). 4 refs. [F.f.] O.R.S.

3899. BUSTINZA, F. Los precursores en la investigación de los antibióticos. Segunda nota. Sobre la actividad antibiótica de las hojas de *Juglans regia* y *Juglans nigra*. [Pioneers in research into antibiotics. Second note. Antibiotic properties of leaves of *J. regia* and *J. nigra*.] *An. Inst. Bot. A. J. Cavanilles* 17 (1), 1959 (15-9). [Span.span.] O.B.D.

Summarizes experiments made with Walnut leaf extracts by Davaine in 1878, and briefly reports confirmatory experiments demonstrating the inhibiting effect of leaf extracts of *J. regia* and *J. nigra* on *Bacillus anthracis*.

3900. MASILUÑGAN, V. A., et al. The antimicrobial activity of extracts from Acacia leaves. *Philippine Journal of Science, Manila* 87, 1958 (7-14). 8 refs. From *abstr.* in *Hort. Abstr.* 30 (3), 1960 (No. 4123).

Methods of preparing extracts from 'acacia' (*Samanea saman*) leaves and their efficacy against *Mycobacterium tuberculosis* and other bacteria.

3901. RAO, J. B., and SASTRY, K. N. S. Isolation of a glucoside from *Anogeissus latifolia*

(Dhava) leaves. *Bulletin, Central Leather Research Institute, Madras* 6, 1960 (529). From *abstr. in Chem. Abstr.* 54 (22), 1960 (25084). P.R.

Glucose was identified in the NH_4SO_4 hydrolysate, and the glucosidic nature of the compound inferred from spectral studies.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 3541, 3819, 3821, 3865.

3902. PANASDHADA, P. [Characteristics of resin and gum.] *Vanasarn* 18 (4), 1960 (86-90). [Siam.e.] Brief account of the Siamese species yielding resin or gum, their distribution, and uses of the products.

3903. WIENHAUS, H., et al. Zur Kenntnis des Lärchenharzes. Die Diterpene Larixylacetat und Larixol. [Notes on Larch resin. The diterpenes larixyl acetate and larixol.] *Chem. Ber.* 93 (11), 1960 (2625-7). [G.g.] P.R.

Describes the IR [infra-red?] spectroscopic examination of a new diterpene ester obtained from the resin of *Larix decidua*, and of a glycol obtained by the saponification of the ester. From authors' summary.

3904. WEINGES, K. Die Lignane des Überwallungsharzes der Fichte. [Lignans of the resin of Norway Spruce.] *Tetrahedron Letters, London* 1960 (20), (1-2). 7 refs. [G.] O.R.S.

Substances isolated were (+)-pinoresinol, (+)-epi-pinoresinol, (+)-lariciresinol, (+)-iso-lariciresinol and (-)-seco-iso-lariciresinol.

3905. MEDNIKOV, F. A., and JANIŠEVSKAJA, M. V. O fizičeskikh i elektrotehničeskikh svojstvakh raznykh kanifolej. [The physical and electrical properties of various rosins.] *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (161-5). [Russ.russ.]

Reports on tests to determine the comparative suitability of rosin from Scots Pine, Spruce, stumpwood, tall oil etc., for use as insulating materials in the electrical engineering industry.

3906. BARDYŠEV, I. I., and ČERČES, H. A. Živica sosny krymskoj—perspektivnoe syr'e dlja kanifol'no-skipidarnoj promyšlennosti. [*Pinus nigra* var. *caramanica* resin—a promising raw material for the rosin and turpentine industry.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (153-6). 11 refs. [Russ.]

Tabulates results of analyses of rosin and turpentine made from *P. n.* var. *caramanica* resin; they compare quite favourably with rosin and turpentine from *P. sylvestris*, and the extension of resin tapping and afforestation with *P. n.* var. *caramanica* is urged.

3907. BRADYSHEV [BARDYŠEV], I. I., and ČERČES, H. A. [ČERČES, H. A.]. Chemical composition of oil of *Picea excelsa*. *Sbornik Naučnyh Rabot, Institut Fizičeskoj i Organičeskoj Himii, Akademija Nauk Belorusskoj SSR* No. 7, 1959 (96-102). [Russ.] From *abstr. in Chem. Abstr.* 55 (4), 1961 (3930). P.R.

A study of the chemical composition of fractionally distilled *P. abies* oil revealed the following fractions: santene, 0.6; tricyclene, 1.5; *l*- α -pinene, 10.0; *l*-camphene, 12.8; *l*- β -pinene, 3.5; 3-carene and β -myrcene, 5.6; cineole, 7.2; *l*-limonene-dipentene mixture, 12; *p*-cymene and *l*- β -phellandrene, 1.2; *l*-camphor, 4; *l*-borneol, *l*-bornyl acetate, 1.5; and sesquiterpene, 2%.

3908. GORYAEV [GORJAEV], M. I., and DZHALILOV [DŽALILOV], D. R. Analysis of the essential oil of Kazakh Juniper. *Trudy Instituta Him. Nauk, Akademija Nauk Kazahskoj SSR* 4, 1959 (57-67). [Russ.] From *abstr. in Chem. Abstr.* 54 (21), 1960 (23203). P.R.

Gives details of the essential oils (yields, chemical characteristics etc.) of *Juniperus communis*, *J. pseudosabina*, *J. sabina*, *J. semiglobosa*, *J. seravshanica*, *J. sibirica*, *J. talassica*, and *J. turkestanica* from Kazakhstan and Central [Soviet] Asia. Excellent results were also obtained for *J. virginiana* cultivated in these regions.

3909. GORYAEV [GORJAEV], M. I., and DZHALILOV [DŽALILOV], D. R. The essential oil of needles of Turkestan Juniper (*Juniperus turkestanica*). *Izvestija Akademii Nauk Kazahskoj SSR (Serija Himičeskaja)* No. 2, 1960 (107-13). [Russ.] From *abstr. in Chem. Abstr.* 55 (1), 1961 (909). P.R.

The oil (650 g.), obtained by steam distillation of freshly gathered needles, was subjected to vacuum fractional distillation, followed by combined chromatography on Al_2O_3 and fractional distillation of the 105 g. residue. Components were identified by oxidation and derivatization, and in most cases by Raman spectra. The composition was: (+)- α -pinene 11, (+)-sabinene 38.4, *p*-cymene 13, 4-terpinenol 23.9, geraniol 0.3, citral 0.7; linalool and its esters 7%. In addition, various unidentified fractions were isolated.

3910. NOZOE, T., and TAKESHITA, H. Cuparene and cuprenene. *Tetrahedron Letters, London* 1960 (23), (14-7). 3 refs. [E.] O.R.S.

[Cf. F.A. 21 No. 991.] Presents results of a study on the neutral part of the essential oil from *Thujopsis dolabrata*.

3911. MURRAY, J. Essential oils of New Zealand Podocarpaceae. III. *Podocarpus nivalis* and *Dacrydium laxifolium*. *J. appl. Chem.* 10 (9), 1960 (366). 4 refs. O.R.S.

Examination of small amounts of these alpine species showed that phyllocladene is the main constituent of their essential oils. [Cf. F.A. 22 No. 2594.]

3912. GORYAEV [GORJAEV], M. I., and SARDAROVA, E. I. Analysis of the essential oil of *Artemisia leucodes*. *Trudy Instituta Him. Nauk, Akademija Nauk Kazahskoj SSR* 4, 1959 (44-8). [Russ.] From *abstr. in Chem. Abstr.* 54 (21), 1960 (23202). P.R.

Gives details of the extraction of camphor from essential oil of *A. leucodes* from the sandy deserts of Kazakhstan, obtained by steam distillation under

pressure. From 450 kg. of plant material, 1907 g. of oil was extracted, in which the max. content of camphor reached 93.3%.

3913. GORYAEV [GORJAEV], M. I., and SAT-DAROVA, E. I. Analysis of the essential oil of *Artemisia serotina*. *Trudy Instituta Him. Nauk, Akademija Nauk Kazahskoj SSR* 4, 1959 (37-43). [Russ.] From *abstr. in Chem. Abstr.* 54 (21), 1960 (23202). P.R.

Lists the chemical components of the essential oil (880 g. of which was extracted by distillation with superheated steam from 120 kg. of wood) obtained from *A. serotina* grown in Kazakhstan. This oil may be used as a basic material for the synthesis of irone.

3914. RIQUE, T. Obtención de extractivos de *Usnea campestris* R. Sant. [Obtaining extractives of *Usnea campestris*.] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 8, 1960. pp. 3. 3 refs. [Span.]

Presents data on methods of extracting the wax-like substances from this lichen, including % yields with different solvents.

3915. PARDO, L. L. Tipos comerciales de cera de retamo. [Commercial types of Retamo wax.] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 7, 1960. pp. 2. 2 refs. [Span.]

Presents brief data on methods of preparation, production in Argentina in 1954-58, commercial types and their uses. [Cf. *F.A.* 19 No. 3654.]

3916. WILLIAMS, L. O. Ucuuba and related wax-like vegetable tallows. *Qualit. Plant. Mater. Veg.* 7 (3), 1960 (295-6). [E.c.g.] E.M.B.

Briefly reviews botanical information relating to some American species of the Myristicaceae producing vegetable tallows. Three genera are involved—*Virola*, *Dialyanthera* and possibly *Osteophloeum*. Tallows from Belém do Pará, Brazil, are likely to be from *V. surinamensis*, those from Colombia from *D. otoba* and those from Southern Brazil from *V. sebifera*, or possibly *V. oleifera*. From author's summary.

3917. HOCKING, G. M. The sweet gum industry in Alabama and future potentialities. *Abstr. in*

Journal of the Alabama Academy of Science, Birmingham, Ala. 31 (4), 1960 (302). L.S.

The original paper described the current methods of producing balsam from *Liquidambar styraciflua* in Alabama, said to be crude and unsatisfactory, and suggested that new methods be tried, including those employed in Honduras for making a similar product from *L. styraciflua* and for making Levant storax from other *Liquidambar* species.

3918. ASPINALL, G. O., JOHNSTON, M. J., and STEPHEN, A. M. Plant gums of the genus *Khaya*. Part II. The major component of *Khaya senegalensis* gum. *J. Chem. Soc. Dec.*, 1960 (4918-27). 15 refs. O.R.S.

[Cf. *F.A.* 18 No. 1159.] Structural studies on one of the two polysaccharide components are described.

3919. ADAMS, G. A., and BISHOP, C. T. Constitution of an arabinogalactan from Maple sap. *Canad. J. Chem.* 38 (12), 1960 (2380-6). 23 refs. O.R.S.

[Cf. *F.A.* 20 No. 5384.] A possible structure is proposed and discussed in relation to other arabinogalactans.

3920. RAO, J. B., and SASTRY, K. N. S. Isolation of sucrose from Babul [*Acacia arabica*] bark. *Bulletin, Central Leather Research Institute, Madras* 6, 1960 (528-9). From *abstr. in Chem. Abstr.* 54 (22), 1960 (25084). P.R.

The solution obtained from the inner-bark extract deposited crystals that were identified as sucrose by molecular wt. (X-ray diffraction), m.p., and elementary analysis. The outer bark contained no sucrose.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses
See also No. 3888.

3921. WAGNER, J. Quercetin-3,4'-diglukosid, ein Flavonolglykosid des Rosskastaniensamens. [Quercetin-3,4'-diglucoside, a flavonol glucoside of Horse Chestnut seeds.] *Naturwissenschaften* 48 (2), 1961 (54). 5 refs. [G.] O.R.S.

892.8. Canes and Bamboos

See Nos. 3712, 3731, 3862.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

902. History of Forests and Forestry

See also No. 3935.

3922. DUVAL, M. Économie et sylviculture dans l'ouest au début du XIX^e siècle. [Forest economy and silviculture in the West [of France] at the beginning of the 19th century.] *Rev. for. franç.* 12 (12), 1960 (761-8). 13 refs. [F.]

3923. HERR, C. S. The development of industrial forestry in the Northeast. University of Washington

College of Forestry, Seattle. 1959. pp. 50. (Col. William B. Greeley Lectures in Industrial Forestry No. 3.) [Cf. *F.A.* 20 No. 1269.]

3924. FRITZ, E. The development of industrial forestry in California. University of Washington College of Forestry, Seattle. 1960. pp. 40. (Col. William B. Greeley Lectures in Industrial Forestry No. 4.) [Cf. *F.A.* 20 No. 1269.]

903. Forest Policy, General

3925. MOLEND, T. Badania nad ekonomiką i polityką gospodarczą polskich lasów państwowych

w latach 1920-1939. [Studies on economics and policy in the Polish State Forests, 1920-39.] *Folia for. polon. (Leśn.)* No. 3, 1960. pp. 212. Many refs. [Pol.pol.russ.g.]

There is a 7-page German summary.

3926. TREGUBOV, V. Rapport au Gouvernement de l'Iran sur une politique de développement forestier. [Report to the Government of Iran on a policy of forest development.] Extended Technical Assistance Program, FAO, Rome. *FAO Report No.* 1297, 1961. pp. 47. [F.] [Cf. *F.A.* 21 No. 2229.]

3927. CHATURVEDI, M. D. Report to the Government of the United Arab Republic on a national forest policy for Syria. Expanded Technical Assistance Program, FAO, Rome. *FAO Report No.* 1314, 1961. pp. 37 + 9 photos, 4 maps. 13 refs.

3928. HUGUET, L. Informe al Gobierno de Cuba sobre política, legislación y administración forestales y ejecución de un programa de fomento forestal. [Report to the Government of Cuba on forest policy, legislation and administration, and the implementation of a programme of forest development.] Expanded Technical Assistance Program, FAO, Rome. *FAO Report No.* 1223, 1960. pp. 133 + 15 photos. [Span.] Limited distribution. [Cf. *F.A.* 20 No. 3981.] An amplified version of report No. 876, brought up to date.

3929. Program for the National Forests. Estimates of work needed and costs by States for the short term—initial 12 years. U.S. Forest Service, Washington, D.C. 1959. pp. 43.

Detailed estimates in connexion with the programme submitted to Congress in March 1959, showing grand totals of \$155 million for recurrent work at maximum annual level—105 for protection and management, 29 for research and 21 for roads and trails—plus 1,675 million for the non-recurrent short-term programme (921, 34, and 720 respectively).

904. General Regional Accounts of Forests and Forestry

See also No. 3967.

3930. BERLIN, J., et al. The New Forest. Galley Press Ltd., London. 1960. pp. x + 201 + 38 plates. Price 30s.

Comprises papers by various contributors on history, geology and botany, wild life, etc., and includes: Silviculture in the New Forest (*H. L. Edlin*).

3931. SÓLYMOS, R. Az örségi erdőgazdálkodás. [Forestry in the Orseg district.] *Erdő* 9 (1), 1960 (9-17 + smries. in suppl.). [Hu.russ.g.]

This area in the S.W. is the best forested in Hungary (38%). Unregulated selection fellings have, under state ownership, given place to planned regeneration and tending, using Larch, Pine, Beech and Hornbeam to form 3-storeyed stands yielding 900 cu. m./ha. at 90 years.

3932. Kovács, J. Erdők a Nyírségben. [The forests of Nyírség.] *Erdő* 9 (1), 1960 (17-25 + smries. in suppl.). [Hu.russ.g.]

This 403,000 ha. area, embraced by the Tisza River and containing 40,000 ha. of forest, is sharply distinguished by its soils, based mainly on sand. Formerly there was much Oak and Oak/Hornbeam, later *Robinia*, Pine and Poplar, and now mixtures of these are planted.

3933. JEDLOWSKI, E. Profilo delle foreste demaniali di Bologna e di Ferrara. [Description of the state forests of Bologna and Ferrara.] *Monti e Boschi* 11 (11), 1960 (531-53). [It.f.e.]

3934. MACDONALD, J. A. B. Belgian forests and forestry: reflections on the visit of May 1960. *Forestry* 33 (2), 1960 (124-30).

Brief notes on *Fagus sylvatica* and *Picea abies* now under transformation to mixed forest by groups; on the species introduced, including exotics such as *Pseudotsuga taxifolia*, *Larix leptolepis*, and *Abies* spp.; on their stability even on the peat, attributable in part to care over conversion, correct decisions over the timing and orientation of group openings, and to sound thinning regimes; on the lessons to be learnt; and on the evidence of enlightened administration and devoted management. *From author's summary.*

3935. CLEPPER, H., and MEYER, A. B. [Editors]. American forestry. Six decades of growth. Society of American Foresters, Washington, D.C. 1960. pp. xi + 319.

A history of the development of forestry in the U.S.A. and of the Society of American Foresters, founded in 1900, in twenty chapters, by different authors, dealing with education, research, literature, silviculture, management, utilization, other uses, public and private activities, etc.

3936. Bos en bosbeheer in Suriname. [Forests and forest administration in Surinam.] Dienst Landsbosbeheer, Paramaribo. 3rd ed. (rev.) 1959. pp. 65 + [5]. 14 refs. [Du.e.] [Cf. *F.A.* 17 No. 4620.]

3937. LANSIGAN, N. P. An appraisal of forestry in the Philippines. *Filipino For.* 11, 1959 (3-50). 41 refs.

A critical assessment, drawing attention to decreasing forest resources (per-capita data tabulated), wasteful logging, inadequate forest protection (particularly against *kaingineros*), insufficient reforestation, lack of finance, and inefficient administration.

905. Forest Statistics and Resources

See also No. 3686.

3938. Österreichische Waldstandsaufnahme 1952/56. Gesamtergebnis. [Total results of the 1952-56 Austrian forest survey.] Forstliche Bundes-Versuchsanstalt Mariabrunn in Schönbrunn, Vienna. 1960. pp. [7] + 323. [G.]

Summarizes and discusses results for the country as a whole and for various regions, provinces, ownership categories, silvicultural systems, etc. [Cf. *F.A.* 21 Nos. 5194-5.]

3939. ILVESSALO, Y. Suomen metsien nykyinen ja mahdollinen kasvu. [The present and potential growth of Finnish forests.] *Metsät. Aikak.* 1960 (8), (253-5). [Fi.]

The National Forest Inventories have shown an increase in annual growth from 39 million cu. m. in the 1920s to 46 in the 1950s; a further increase to 66 million cu. m. is considered possible. Further drainage of peat-lands and probably the use of tree breeding and of fertilizers will be needed to ensure the increased growth.

3940. GILL, C. B. The forests of Manitoba. Report No. 10. Forest Resources Inventory. Manitoba Forest Service, Winnipeg, 1960. pp. 43.

The last of a series of bulletins summarizing the results of the survey work completed in 1956. [Cf. *F.A.* 20 No. 5412.]

3941. GLERUM, B. B. Report to the Government of Brazil on a forestry inventory in the Amazon valley (Part Five). (Region between Rio Caete and Rio Maracassume.) Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1250, 1960. pp. 67 + 3 maps, 5 sets of dgms. [E.] Limited distribution.

[Cf. *F.A.* 20 No. 5420.] Covers a very inaccessible region E. of the Amazon estuary. Once the planned Belém-São Luis road is constructed, small sawmills, relying mainly on *Carapa guianensis*, are thought to be an economic possibility, but not veneer or paper mills.

906. Direct Economic Significance of Forests (Position of Forests and Forestry in the National Economy)

3942. COPES, P. The place of forestry in the economy of Newfoundland. *For. Chron.* 36 (4), 1960 (330-41). 7 refs.

907. Indirect Significance of Forests (Rural Amenities, National Parks, Forest Influences etc.)

See also section 116.

3943. RIVAILLON, P. La réserve nationale de la Pointe d'Arçay (Vendée). [The national [nature] reserve of Pointe d'Arçay (Vendée).] *Rev. for. franç.* 12 (12), 1960 (749-60). [F.]

3944. IZDEBSKI, K. Istnienie i projektowane rezerwy leśne województwa lubelskiego z uwzględnieniem ich osobliwości florystycznych. [Actual and planned forest reserves covering particular floristic features in the Lublin district.] *Sylvan* 104 (10), 1960 (27-35). 22 refs. [Pol.]

There are 11 actual forest reserves, and 6 more planned. Brief notes are given on the special floristic features of each.

3945. KURTH, A., WEIDMANN, A., and THOMMEN, F. Beitrag zur Kenntnis der Waldverhältnisse im Schweizerischen Nationalpark. [Forest conditions in the Swiss National Park.] *Mitt. Schweiz. Anst. Forstl. Versuchs.* 36 (4), 1960 (221-378 + 35 photos, 3 dgms., 14 maps). [G.g.f.it.e.]

Methods and results of a systematic sample survey of ca. 3600 ha. of high forest and 1650 ha. of

dwarf Pines, which had been protected from all interference for ca. 50 years, at 1800-2200 m. alt. in the Grisons. Information collected on 2050 sample plots of varying size, and evaluated by punched card, included general enumeration data and data on site, vegetation, regeneration and value. The volume and value of the growing stock was poor. One-quarter of the 20 million trees >1.3 m. high were dead or damaged, and m.a.i. of stemwood was 0.83 cu. m./ha. *Pinus mugo* was the dominant species, but development appeared to favour *P. cembra* and Larch.

3946. Erić, N. Perućica—naš prašumski rezervat. [Perućica—our virgin forest reserve.] *Šum. List.* 84 (7/8), 1960 (216-9). [Croat.g.]

A brief account of the location, species composition, structure and scientific interest of this 1243-ha. area, which lies at 1787 m. alt. beneath Mt. Maglić, Bosnia.

3947. EDDY, A. R. Forest recreation. *For. tech. Pap. For. Comm. Vict.* No. 5, 1960 (13-9). 9 refs.

Discusses various aspects of forest recreation, stressing the conflicting social and political pressures often brought to bear upon the forester. A definition of forest recreation is attempted.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 2659-61, 2663, 2667-9, 2719, 3503, 3507, 3967.

3948. Symposium on land use. Publication, Newfoundland Research Committee, St. John's No. 2, 1959. pp. 79 + 2 maps.

Land use problems of Newfoundland (*P. J. Murray*); Land-use work of the Federal Geographical Branch (*N. L. Nicholson*); The use of land adjacent to public highways (*A. L. S. Nash*); Agricultural aspects of land use (*H. W. R. Chancey*); Use of lands outside thickly populated areas (*J. T. Allston*); The role of aerial photography in land use planning (*R. C. Hodges*); Methods of increasing the yield of Newfoundland forest land (*D. E. Nickerson*); Wildlife in relation to land use (*S. S. Peters*).

3949. MACGREGOR, J. J. [Editor]. Course on land use for forestry and agriculture (23rd June-29th July, 1959) on theoretical determinants in land use policy and problems in land use demonstrated on tours. *Emp. For. Rev.* 39 (4), 1960 (443-62).

First summarizes the theoretical determinants in land-use policy related to the 18 lectures given at Oxford in connexion with this course, and then gives, in some detail, an account of the problems in land use demonstrated in tours of England and Wales, Switzerland, Italy and France. In a future issue of the *Empire Forestry Review* it is hoped to give a selection from the papers submitted by some of those who participated in the course and in the tours that followed it. *From author's summary.*

3950. RYLE, G. B. Wood or mutton: economics or politics. *Forestry* 33 (2), 1960 (121-3). 4 refs.

A review of K. R. Walker: "The Forestry Commission and the use of hill land" [cf. *F.A.* 21 No. 5207].

92. Forest Ownership and Ownership Policy

See also Nos. 3923-5, 3929, 3933, 3950.

3951. ANDERSON, W. C. The small forest landowner and his woodland. *Sta. Pap. Stheast. For. Exp. Sta.* No. 114, 1960. pp. 15.

A survey based on interviews with 100 owners in rural Georgia, and 100 in an industrialized N. Carolina region, discussing their age, occupation, period of ownership, size of holdings etc. in relation to their attitude to management practices, stand improvement, protection and planting. Though small properties are defined as those <5000 acres, ca. 80% of the owners, the majority of whom were middle-aged farmers, held <100 acres.

3952. TEEGUARDEN, D., CASAMAJOR, P., and ZIVNUSKA, J. Timber marketing and land ownership in the central Sierra Nevada region. *Bull. Calif. Agric. Exp. Sta.* No. 774, 1960. pp. 72. 19 refs.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also No. 3525.

3953. [The Royal Forestry Act (No. 4) of 1960.] *Vanassarn* 18 (4), 1960 (109-12). [Siam.]

The text of the amendments and additions to the existing Acts of 1941 and 1951, together with the Forest Department's preamble.

3954. Ley forestal. [Forest law [of Mexico].] *Diario Oficial, México* 238 (13), 1960 (7-17). [Span.]

Effective from 1 Feb. 1960, this law abrogates that of 1947 with its regulations and amendments.

94. Other Methods to Implement Forest Policy

945.2. Publicity, Propaganda (including Demonstration Forests)

3955. LOVE, L. D. The Fraser Experimental Forest—its work and aims. *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 8 (rev.) 1960. pp. 16.

945.4. Research

See also No. 3771.

3956. [Special number to celebrate the 50th anniversary of the Forestry Society of Finland.] *Acta for. fenn.* 70, 1959. pp. 261.

Contains a number of articles on the development and achievements of various branches of forest research in Finland.

3957. GOTTWALD, P. J. H. Summary report to the Government of the Union of Burma on wood anatomy and biology. Expanded Technical Assistance Program, FAO, Rome. 1960. pp. 13. Restricted.

The writer was sent to Burma to initiate and carry

out research and investigations, make suggestions for a research programme, and procure additional equipment.

3958. BROWN, H. J. Publications of the Southeastern Forest Experiment Station 1921-1958. *Sta. Pap. Stheast. For. Exp. Sta.* No. 117, 1960. pp. 115.

Lists, alphabetically by authors, some 1700 articles and other publications of the staff of the Southeastern Forest Experiment Station and its predecessor the Appalachian Forest Experiment Station.

946.1. Associations, Societies

See Nos. 3935, 3956.

946.2. Conferences and Excursions

3959. Skog og tre 1960. [Forest and timber 1960.] *Norsk Skogind.* 14 (11), 1960 (413-8, 427-40, 470-3). [Nor.] P.R.

Comprises papers—some with English summaries—read at the conference 'Skog og Tre' on: Forestry and the forest industry in relation to EFTA and free trade (*Ø. Nossen*); [The advantages of] rapid turnover of wood at the Toten Cellulosefabrik (*E. Dannevig*); Damage [by insects and fungi] during transport and storage (*B. Halvorsen*); Can the time for transport and storage be reduced? (*K. Wibstad*); Timber and the use of sawmill waste in the U.S.A. (*H. Skjelmerud*); and Comparing measurements of lumber recovery from band and circular resaws (*G. Hvamb*) [cf. *F.A.* 18 No. 2129]. The first four papers also appear in a rather shorter form in *Norsk Skogbr.* 6 (21), 1960.

3960. Skog og tre 1960. [Forest and timber 1960.] *Norsk Skogbr.* 6 (21), 1960 (713-5, 719, 723-7, 731-8). [Nor.]

Comprises extracts from papers read at the conference 'Skog og Tre' on: Lorries in timber transport (*B. Akre*); Economic effects of forest taxation (*J. Eid*); Expenditure by forestry on social insurance (*F. Alexander*); and papers by *Ø. Nossen*, *E. Dannevig*, *B. Halvorsen* and *K. Wibstad*, which have been referenced from longer versions [cf. preceding abstract].

3961. Jahresversammlung des Schweizerischen Forstvereins in Liestal vom 25. bis 27. September 1960. [Annual meeting of the Swiss Forestry Association at Liestal, 25-27 Sept. 1960.] *Schweiz. Z. Forstw.* 111 (11), 1960 (535-97 + 1 map). Many refs. [G.f. or F.g.]

Includes: The utilization of hardwoods for semi-chemical pulp and paper (*J. Risi*) [advocating the erection of small mills in Switzerland—cf. *F.A.* 13 No. 1688]; Silvicultural planning for better financial yields (*H. Leibundgut*) [with a sample plan, and stress on regeneration and choice of species in irregular shelterwoods to achieve maximum mean value increments—cf. *F.A.* 14 No. 1095; 17 No. 4350]; Internal consumption of hardwood and export possibilities (*J. Keller*); and Site mapping and afforestation (*W. Kuhn*; *W. Trepp*; and *J. J. Richard*).

3962. Az Országos Erdészeti Egyesület vándorgyűlése. [The tour-conference of the Hungarian Forestry Association [July 1960].] *Erdő* 9 (8), 1960 (281-316 + smries. in suppl.). [Hu.russ.g.]

Reports 5 papers and the tour notes, covering the Conference's discussion of proposals for the second (5-year) revision of the working plan for Central Somogy (34,477 ha. of state forest).

95. Forest Taxation

See also No. 3960.

3963. KROTH, W. Die Systeme der Waldbesteuerung und die steuerliche Belastung privater Forstbetriebe in einigen europäischen Ländern. [Forest taxation systems and the tax burden of private forestry in some European countries.] BLV Verlagsgesellschaft, Munich. 1960. pp. xii + 435. Many refs. [G.]

Part I describes and discusses the tax systems of W. Germany, Austria, Switzerland, United Kingdom, France, Sweden and Finland, including rates and other dues, death duties, and principles of valuation and assessment affecting forestry. Part II attempts to compare the total burdens, per hectare and per cu. m. wood. Small estates are thought to be most heavily taxed in Germany, Switzerland and Austria, and least in Sweden and the U.K.; large estates most in Sweden, and least in France.

3964. EID, J. Økonomiske virkninger av skogbeskatningen. [Economic effects of taxation on forestry.] *Norsk Skogind.* 14 (12), 1960 (502-10). [Nor.e.] P.R.

The complete version of a paper already noticed from a shorter version [see F.A. 22 No. 3960].

3965. SAMSON, N. T. Timber depletion—[U.S.A.] Federal income tax. *J. For.* 59 (1), 1961 (8-14). 18 refs.

The allowance of a deduction from taxable income for timber depletion (timber treated as a wasting asset like minerals, oil, gas etc.) is made so that the cost of a stand plus the proper capitalized charges may be recovered tax-free as the stand is removed. Who is entitled to depletion, how it is determined and adjusted to changes, when it occurs, how it is claimed for, etc., are discussed with citations of law, legal decisions, and other authorities.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also Nos. 3023, 3960.

3966. ZIESING, H. Die Formen des Arbeitslohnes und ihre Anwendung in der Forstwirtschaft. [Wage systems and their use in forestry.] *Forst u. Jagd* 11 (1), 1961 (8-12). 17 refs. [G.]

Discusses the merits of various systems. The piece-rate system, it is thought, has been extended too far and should be replaced by premium systems for operations for which proper rates have not or cannot be fixed, particularly for tending, road maintenance, and protection work. Payment to small groups, i.e. 2 to 5 workers, is thought to be the best method to stimulate both individual incentive and group co-operation.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences, Excursions

See also No. 2894.

3967. Erdőnevelési konferencia Budapest, 1959 Szeptember 6-12. [Conference on the tending of forests, Budapest 6-12 Sept. 1959.] *Erdő* 8 (11), 1959 (401-48 + smries. in suppl.). [Hu.g.russ.]

Includes notes on the following papers: Forest research in Hungary (*F. Erdei*); Present condition and development aims in Hungarian forestry (*G. Balassa*); Practical and theoretical questions regarding intermediate fellings in Hungarian forests (*B. Keresztesi*); Intermediate fellings in connexion with improvement of the value yield of Poplar and Beech stands (*J. Magyar*); The importance of intermediate fellings in forest exploitation (*E. Sali*); Present position in research on intermediate fellings in Hungary (*A. Majer*); Intermediate fellings in Hungarian state forest enterprises (*G. Holdampf*); Raising forest productivity in Bulgaria (*B. Petkov*); Possibilities for increasing increment by the conversion of stands (*J. Čizek*); Afforestation of poor soils in Denmark (*G. Schlätzer*); Forest research in Finland (*P. Yli-Vakkuri*); Present position and principles of development of forestry in Iraq (*A. R. Al-Adhami*); Principles of silvicultural tending in Poland (*E. Ilmurzynski*); Choice of stand density and intermediate fellings for increasing forest productivity (*W. Erteld*); Economic and industrial importance, in countries poor in timber, of industrial plantations outside the forest (*G. Giordano*); Forestry in the Rumanian People's Republic (*O. Petrutiu*); Present position and development of forestry in Albania (*L. Treska*).

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References: 1. *Allgemeine Forstzeitung*, Munich; 2. *American Forests*, Washington; 3. *Angewandte Chemie*, Weinheim/Bergstrasse; 4. *Bois et Scieries*, Paris; 5. *Boletin Argentino Forestal*, Buenos Aires; 6. *Daily Telegraph*, London; 7. *D.S.I.R. Release*, London; 8. *Financial Times*, London; 9. *Forest Log*, Salem, Ore.; 10 *Forest Products Journal*, Madison, Wis.; 11. *Holz-Kurier*, Vienna; 12. *Indian Forester*, Dehra Dun; 13. *Lesnoe Hozjajstvo*, Moscow; 14. *North Borneo Forest Dep. Research Programme*, Jesselton, N. Borneo; 15. *Research News, Forest Products Research Branch*, Vancouver; 16. *Scottish Forestry*, Edinburgh; 17. *Southern Lumberman*, Nashville, Tenn.; 18. *Wood*, Chicago.

Argentina. The first course at the New Forestry School of the University of La Plata (2 years' theory with 12 weeks' practical work) began in March 1961. It is open to graduates who have completed 3 years in the Faculty of Agronomy and Natural Sciences, and those who complete the course will be styled "Ingeniero forestal". The Federal Government has assisted the establishment of the School by giving it the use of the Santa Rosa y San Juan estate, as well as an annual subsidy of two million pesos (5; Feb. 1961).

Austria. Full-grown park trees in Vienna, displaced by extensive road-building, were recently winched to new sites after their root systems had been encased in concrete and severed from the soil below by steel cables (11; 13.4.61).

Canada. As part of an investigation to determine the cause of variation in the moisture content (m.c.) of laminating stock, a check was made at the Vancouver Laboratory, Forest Products Research Branch, to determine whether the electric moisture meter is accurate under a wide range of temperature conditions. This was done at 0, 70, and 160° F., which were considered as being representative of the ranges that might be encountered when such lumber is tested. The results showed that, under normal testing procedure for wood at 10% m.c., the electric moisture meter gave an average m.c. reading within 2% of the value calculated by the oven-dry method, which was considered to be within acceptable limits of accuracy (15; 15.5.61).

Extensive use is being made of Western Red Cedar sawdust in certain sections of the ultra-modern trans-Canada highway, in places where it is desired to cross bogs and marshes rather than to make a detour round them. A blanket of sawdust, many feet thick, is laid across the bog, spread, and compressed by bulldozers. This forms a stable sub-stratum for the subsequent layers of the roadway. Western Red Cedar sawdust, because of its texture, weight, and durability, is particularly suitable for this work, and enables the highway to cross bogs where conventional ballasts such as rock, sand, or gravel would be quite useless (17; 1.1.61).

Denmark. In order to test his theory that C^{14} is being deposited in greater amounts round the 50th parallel than in other latitudes, which, if true, would greatly affect the accuracy of radio-carbon dating, a Danish scientist is measuring the C^{14} content of grass on every second parallel from the North Cape to Sicily (1; 1.5.61).

Great Britain. A packet of seed was recently sent to each Conservator in the Forestry Commission. As each contained about 6 oz. of Larch seed, enough to sow only a few yards of bed, it might seem scarcely worth mention. The seed, however, was the first distributed produce from the Forestry Commission's seed orchards, and is noteworthy on that account. The trickle of seed now available can be expected to swell quite quickly to a stream sufficient to supply the whole country's needs in the Larches, and later in Scots Pine (16; April 1961).

As a first step to selective breeding for timber quality, specimens of wood taken from trees grown in various parts of Britain are being examined by radio-isotope methods at the Forest Products Research Laboratory, Princes Risborough. The apparatus developed for this purpose is completely automatic, and micro-scale measurements of density, which would formerly have been a very laborious process, can easily be made without human intervention, by measuring the transmission of beta particles (electrons) through a thin specimen of wood. The Forestry Commission has begun its survey by taking samples from some 180 Sitka Spruce trees growing in parts of Britain as widely separated as the North of Scotland and the South Coast (7; 11.5.61).

Experiments are being made in growing trees in the concrete foundations of a war-time army camp on the Lowther estate at Penrith, Cumberland, on 34 acres known as the Elysian Fields. As the cost of clearance would have been prohibitive, it was decided to blast holes in the concrete and plant in

them. Local quarrymen blew 18-in. holes with gelignite, and a local limestone works provided topsoil to fill them. Larch, Sycamore Maple, Douglas Fir and Beech planted in this way have been quite successful; Oak, Scots Pine, and Norway Spruce have had to struggle, not because of the concrete, but because of the excessive lime in the soil (6; 21.4.61).

A voluntary code of conduct to minimize risks from spraying farm crops from the air has been subscribed to by firms responsible for nearly 90% of the acreage dealt with by aircraft. It was prepared by the National Association of Agricultural Contractors after close consultation with the Ministry of Agriculture, the Ministry of Aviation, the National Farmers' Union, and the National Association of Corn and Agricultural Merchants. Weed-killers will be applied from the air only after all parties concerned, viz. the aerial operator, the ground organization, and the farmer, have satisfied themselves "beyond reasonable doubt" that they can be used without damage to neighbouring crops or property (6; 7.4.61).

India. Owing to the increased demand for fuelwood at Cuttack, the most populous city of Orissa State, even Lantana finds a market. A large area of Teak plantations in Churang reserved forest, Puri division, has been infested with Lantana, which in Sept. 1960 was cut from an area of 1287 acres, and disposed of for Rs. 2220 (12; Feb. 1961).

Lebanon. One of the largest and oldest of the surviving Cedars of Lebanon having died, it is intended to determine its exact age by a ring count. For this purpose, the Under-Secretary for Forestry is sending to America for a saw large enough to cut a cross-section of the bole in one operation. This will not be easy, as its diameter is 16 ft. and its girth 49 ft. at the base. Its age is roughly estimated as 3000 years. It will take about a month to count the rings. During its first 40–50 years, a Lebanese Cedar attains a diameter of 20 in., and grows <0.5 in. a year for the next 50 years. After that, the growth rings are very small indeed—ca. 3/1000 of a mm. each (6; 21.4.61).

North Borneo. On 31 Jan. 1961 a disastrous fire destroyed the whole of the research buildings of the Forest Department and most of their contents. The herbarium collection of 20,000 species was an almost total loss, including a large number of wood and bark specimens. The draft revision of H. G. Keith's "The timbers of N. Borneo" and a great many of the ecologist's files also got burnt (14; 1961).

U.S.A. The Georgia Forestry Commission decided in 1958 that, instead of using contract aircraft, it would build up its own fleet for fire-control work. It now operates 27 planes, including sixteen 150-h.p. Piper PA 18 aircraft, each equipped with an air-to-ground loudspeaker system so that pilots can talk directly to firefighters; two Beachcraft T34 Navy surplus aircraft, also for surveillance; a Cessna 180 and a Piper Comanshee for transport of fire-fighting personnel, a torpedo bomber converted as a 'spray bomber'; and two Bell helicopters. All planes are radio-linked to a state-wide fire-control network. The value of the aircraft in spotting fires and picking out the most rapid approach routes for ground crews is seen from the size of the average Georgia fire. Last year it was 7.55 acres per fire, as against 14 acres before large-scale aerial detection was used. Out of the state's 12 cents/acre/year on all fire-control services, the total cost of the air fleet is only $\frac{1}{2}$ a cent. (2; April 1961).

Word from the S.W. Oregon district indicates that all 'hard hats' (safety helmets) have been painted a fluorescent "rocket red" colour to facilitate recognition from the air. It is thought that this will assist immensely in the direction of ground crews, from the air, to small fires that are difficult to detect, and will provide a greater safety margin when dropping fire retardants, since the pilot will be better able to spot ground crews, and thus avoid endangering them with bombing drops (9; May 1961).

An American firm, Bioferm Corp, is producing an insecticide on a microbial base, called Thuricide. It consists chiefly of spores of *Bacillus thuringiensis* and is lethal only to certain leaf-eating insects and caterpillars. It is non-toxic to plants and animals (3; Dec. 1960).

A three-state programme to re-establish the valuable fur-bearing fisher (*Martes pennanti*) in the forests of the Pacific Northwest also marks one of the first attempts at biological control of the porcupine. The programme is now at mid-point: Montana completed her efforts in 1960, Oregon's part is being completed now, and Idaho hopes to obtain stocks in winter 1961–62. Oregon expects to introduce about 20 fishers. Successful introductions in Nova Scotia and Wisconsin have shown that relatively few animals are required. The fishers used in the introductions are obtained from professional fur-trappers in British Columbia at a cost of \$100 per animal; recent prices on the Seattle Fur Exchange have varied from \$25 to \$125 per pelt. The diet of the largely carnivorous fisher includes, besides porcupine, deer carrion, small rodents, birds, and some berries (2; April 1961).

Among the devices contemplated at U.S. Forest Research Center, Washington, are the attachment of radio transmitters to porcupines, and the installation of traffic counters in the forest. The idea of radio-equipped porcupines is for the purpose of studying this animal's movements and habits as it roams and feeds destructively on the bark and cambium of young trees. The traffic-counter installation is already being used to count mountain beavers' trips to and from their homes on food-foraging forays (9; May 1961).

A pair of mammoth scissor blades operated by hydraulic pressure cuts down trees for pulpwood in an experimental American machine. Seven seconds is the reported cutting time for stems up to 19 in. diam. at ground level. The shears are built into a tractor-like machine which also trims branches from the fallen stem and cuts it into pulpwood lengths. A "pincer" arm lifts the tree to the top of the tractor, where blades mounted on a foot-wide belt shave down branches up to 6 in. diam. Stems are then sawn into 4-ft. lengths and loaded on to a trailer. When the trailer is full the logs are bundled and dropped off to be picked up by a loading crane. Two men operate the machine, which was built for a large U.S. paper company (8; 2.6.61).

A new technique, said to be the first continuous process for making plywood, is announced by the Georgia-Pacific Corp., Springfield, Oregon. Centred on a new 41-ft. high, 60-opening hot press (claimed to be the world's largest), the process reverses the conventional method of plywood manufacture in that green veneers move continuously and directly from the log into the press and are heat-bonded with dry glue and outside layers of resin-impregnated kraft pulp into a completely dry panel ready for shipment, since veneer drying actually occurs in the hot press. The new 5-ply product—"Fiber-Ply"—which replaces the regular 3-ply construction in the $\frac{3}{8}$ -in. thickness, consists of two plies of resin-impregnated wood fibre and three of wood veneer, while the $\frac{1}{2}$ -, $\frac{5}{8}$ - and $\frac{3}{4}$ -in. thicknesses are 7-ply. Claimed to be highly stable and strong, the panels have a smooth one-piece surface on both sides, which forms an integral part of the panel and is said to reduce paint requirements while extending the life of the paint job and, at the same time, to eliminate checking and minimize grain rise. Low costs and good timber utilization are claimed, since the process allows use of low-grade veneers in an upgraded product, initial production of which is set at 2,600,000 sq. ft. per month of both exterior and interior grades in 4×8 -ft. panels, calculated on a $\frac{3}{8}$ -in. basis (18; April 1961).

Cellon, a new preservative process developed by the Koppers Company, uses liquefied gas in a pressure chamber to deposit the preservative chemicals in the fibres of the wood. It is said to give a clean surface and high penetration, and, because it does not swell the wood, to be suitable for dry and finished-to-size parts as well as for green wood (10; May 1961).

The Southwestern Settlement & Development Co., Jasper, Texas, are producing bricks from kiln-dried Southern Pine, though in South America, where the idea originated, wood bricks have been made from a variety of timbers. The present $3\frac{5}{8}$ -in.-square bricks come in different lengths, viz. 20 in. (full block), 10 in. (half block), and $16\frac{3}{8}$ and $13\frac{3}{8}$ in. for corners and tees, are factory-drilled for nailing, and are made in both tongue and groove types to expedite construction. Additional strength is obtained by applying glue between bricks, and highly weatherproof joints are possible by caulking in the grooves (18; April 1961).

U.S.S.R. The recipe of a home-made hare-repellent, reported by the newspaper 'Socialistic Donbass', is as follows: mix 1 kg. of sunflower oil and 1 kg. of animal (or fish) fat. Heat the mixture to 35°C ., stirring well, then add 25 g. BHC and mix thoroughly. After the concoction has cooled to room temperature, it should be painted on the lower part of the stem of young trees. The repellent action lasts for three months, and 2 kg. of the emulsion is sufficient for 200 trees (13; Feb. 1961).

What is claimed to be the largest single plant in the world for wood conversion is under construction at Bratsk. It is designed to deal annually with 4 million cu. m. of timber and wood products, the motive power being derived from the hydro-electric scheme on the Angara River, which will include a reservoir covering 5500 sq. km. The rich conifer forests that cover this area, which must disappear, are estimated to contain 40 million cu. m. of standing timber. For the long-term supply of raw material, some 32,000 sq. km. of forest, divided into 12 conservation districts, will be exploited and regenerated at a rate of 22,000 ha. per annum. Mean age of exploitation, in view of the slow growth of trees in this region, is fixed at 140–145 years (4; 11.5.61).

FOREST SCIENCE

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